



TurboVap[®] LV

User's Manual



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Preface

Copyright

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Content

The information in this manual may contain typographical errors or technical inaccuracies and is subject to change without notice. Modifications may also be made to the product described in this manual at any time.

Proper Equipment Operation

The TurboVap LV Evaporator uses a patented gas vortex shearing technique to concentrate samples quickly. It is a microprocessor-controlled instrument for simultaneous, automated concentration of multiple samples with unattended operation, convenience and speed. It is the customer's responsibility to determine suitable conditions for evaporation of their own samples.

WARNINGS



- *The TurboVap LV is **NOT** designed for in vitro testing or for use with highly corrosive acids.*
- *To reduce the risk of electric shock, do not remove the cover. No user serviceable parts are inside. Refer to qualified service personnel if help is required.*
- *Use this product only in the manner described in this manual. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.*

AVERTISSEMENTS



- *Pour réduire le risque de choc électrique, ne pas retirer le couvercle. Ce produit ne contient aucune pièce pouvant être réparée par l'utilisateur. Au besoin, confier l'appareil à un réparateur qualifié.*
- *Ce produit ne doit être utilisé que comme décrit dans ce manuel. Si cet appareil est utilisé d'une manière autre que celle spécifiée par le fabricant, la protection fournie par l'appareil peut être entravée.*

Product Safety Warning

The TurboVap LV power switch is the same type of power switch used on most laboratory equipment such as gas chromatographs, spectrophotometers, liquid chromatographs, and computers. The TurboVap products are safely used in the laboratory when “Good Laboratory Practices” are followed as with any other lab equipment. All fans are brushless motor fans and will not ignite vapors. The TurboVap is not classified as “Explosion Proof” and its use is at the discretion and risk of the operator or laboratory supervisor/manager. The TurboVap is equipped with a non-arcing fan, solid state electronics, and provisions for vapor collection. Do not change the configuration of the TurboVap LV ventilation system. Please consult with Biotage if you have any questions or concerns regarding this subject.

WARNING



TurboVap products are NOT classified as “Explosion Proof.” The power switch is an arcing source and could ignite explosive vapors if present.

Contact Biotage 1-Point Support

Biotage 1-Point Support provides expert services including telephone troubleshooting of products, repair instructions, service dispatching and replacement part information.

Before you call:

Check the online Help and the manual for a probable cause and solution to your question.

Have the following information available for the customer support representative:

- Workstation serial number(s)
- If applicable, the error displayed on the LCD display

To reach the **Biotage 1-Point Support**:

US: 1-800-446-4752 or US-1-pointsupport@biotage.com

Europe and Asia-Pacific Regions: +46 18 56 57 11 or
EU-1-pointsupport@biotage.com

Japan: +81 422 28 1233 or JP-1-Pointsupport@biotage.com

Biotage Product Repair Depot

The Biotage Product Repair Depot offers product repair services, upgrades, refurbishment and installation at reasonable costs and with quick turnaround for all customer-owned equipment and accessories. For further information or to obtain a quotation for services, contact the Depot:

US: 1-800-446-4752 or US-1-pointsupport@biotage.com

Europe and Asia-Pacific Regions: +46 18 56 57 11 or
EU-1-pointsupport@biotage.com

Japan: +81 422 28 1233 or JP-1-Pointsupport@biotage.com

Features of the Biotage Product Repair Depot:

- Factory-trained repair technicians
- Two week turnaround from receipt at Biotage

Shipping:

Customers are responsible for shipments both to and from Biotage, specifying the carrier and choice of service.

Return Policy:

To ensure a safe environment for all our technicians, it is mandatory for each returned product to include our chemical questionnaire stating contact chemicals, chemicals used during application and cleaning steps taken prior to shipment.

Processing:

Once the product is returned, it is evaluated for necessary repairs. The customer is contacted with an estimate and may choose to go ahead with the repair or decline service. If service is denied, a minimum evaluation charge may apply. Upon completion of the repair, a purchase order or appropriate means of payment is required before return shipment.

Service and Customer Support Plans

Biotage offers a full range of services to ensure your success. From our original factory warranty through a comprehensive line of customer support plans, Biotage AB offers you Field Service Engineers and In-house Specialists who are dedicated to supporting your hardware, software and application development needs.

US: 1-800-446-4752 or US-1-pointsupport@biotage.com

Europe and Asia-Pacific Regions: +46 18 56 57 11 or
EU-1-pointsupport@biotage.com

Japan: +81 422 28 1233 or JP-1-Pointsupport@biotage.com

Our programs can include such useful services as:

- preventative maintenance
- diagnostic servicing performed on-site by Biotage AB field service engineers
- extended use of the Biotage AB Customer and Technical Support Center
- automated, remote troubleshooting
- software updates
- after-hour, weekend and holiday support
- repair depot servicing
- parts, labor and travel expense coverage
- other customized services upon request

FCC

This device complies with part 15 of the FCC (United States Federal Communications Commission) Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

CE

This device complies with all CE rules and requirements.

NOTE

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

REMARQUE

Tout changement ou modification apporté à cet instrument non expressément approuvé par l'entité responsable de la conformité peut annuler l'autorisation d'opérer l'appareil accordée à l'utilisateur.

Table of Symbols

Table 1 contains symbols that identify particularly important information and alert you to the presence of hazards. These symbols may appear in this manual and/or on the product it describes.

Table 1. Important Symbols

Symbol Symbole	Description Description
	DANGER: An imminently hazardous situation, which, if not avoided, will result in death or serious injury. DANGER : Situation présentant un danger imminent qui, s'il n'est pas éliminé, peut entraîner des blessures graves, voire la mort.
	WARNING: Caution, risk of danger. Refer to the User's documentation. AVERTISSEMENT : Attention, danger potentiel. Se reporter à la documentation de l'utilisateur.
	NOTE: A cautionary statement; an operating tip or maintenance suggestion; may result in instrument damage if not followed. REMARQUE : Énoncé indiquant une précaution à prendre, un conseil de fonctionnement ou une suggestion d'entretien; son non-respect peut provoquer des dommages à l'instrument.
	Hazardous voltage; risk of shock injury. Tension dangereuse; risque de blessure par électrocution.
	Crush hazard. Risk of body parts, hair, jewelry, or clothing getting caught in a moving part. Danger d'écrasement. Faire attention que les parties corporelles, les cheveux, les bijoux ou les vêtements ne soient pas pris dans une pièce mobile.

Table 1. Important Symbols (Continued)

Symbol Symbole	Description Description
	Risk of puncture injury. Risque de blessure par piqûre.
	Risk of eye injury; wear safety glasses. Risque de lésion oculaire; porter des lunettes de sécurité.
	Risk of exposure to biohazards. Risque d'exposition à biohazards.
	Risk of fire. Risque d'incendie.
	Risk of poison. Risque d'empoisonnement.
	Risk of explosion. Risque d'explosion.
	Hazardous fumes. Émanations dangereuses.
	Hot surface; risk of burns. Surface chaude; risque de brûlures.
	Protective ground symbol. Symbole de terre de protection.
	Ground symbol. Symbole de terre.
	Fuse. Fusible.
	Alternating current. Courant alternatif.
	On (supply). Marche (alimentation).
	Off (supply). Arrêt (alimentation).
	CE compliance mark. Marque de conformité CE.
	Signifies that the unit has passed safety tests for grounding, power line transience, and current leakage. Signifie que l'appareil a réussi les tests de sécurité pour la mise à la terre, le courant transitoire de ligne d'alimentation et la perte de courant.

Table 1. Important Symbols (Continued)

Symbol Symbole	Description Description
	Input. Entrée.
	Output. Sortie.
Equipment labels are color coded: Les étiquettes de l'appareil sont codées couleur:	Yellow Caution, risk of danger Red Stop Blue Mandatory action Green Safe condition or information Jaune Attention, danger potentiel Rouge Arrêter Bleu Intervention obligatoire Vert Condition sûre ou informations de sécurité

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Introduction

The Biotage TurboVap LV Evaporator is a microprocessor-controlled evaporator that provides simultaneous, automated concentration of multiple samples, unattended operation, convenience, and speed. The TurboVap LV can simultaneously process up to 50 samples in many popular test tube, centrifuge tube, and micro-centrifuge tube sizes.

This section of the manual describes the features of the TurboVap LV evaporator.

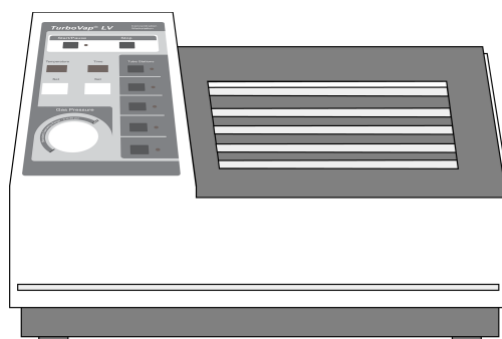


Figure 1. The TurboVap LV

Gas Vortex Shearing Action

The evaporator uses a patented “gas vortex shearing action” that maintains high evaporation rates regardless of sample height in the tubes. A helical flow of air is created by the stream of gas directed into each sample tube. The helical flow sets up a vortexing action that provides for sample homogeneity and continuous rinsing of the tube wall. The vapor-laden gas exits via an unobstructed path up the center portion of the tubes and is removed by an exhaust fan to the exhaust port in the back of the unit. From the exhaust port, the exhaust duct is routed through the vent tubing to a suitable, outside-vent location.

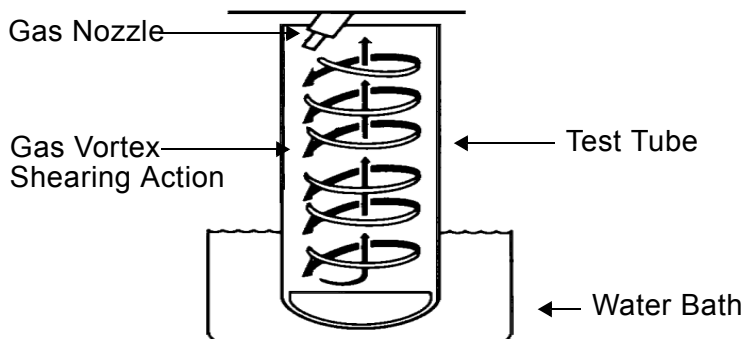


Figure 2. Gas Vortex Shearing Action

Automated Evaporation

The TurboVap LV uses an integrated microprocessor to automatically time the operation, control water bath temperature, automatically turn the gas off, and perform operational diagnostics.

Convenience

The TurboVap LV enables you to start a run of samples and leave the evaporator unattended. When the specified time has expired, the gas turns off automatically and the evaporator sounds an alarm. The alarm continues to beep every 30 seconds until operation is stopped.

Multiple Sample Processing

The evaporator has five manifold rows. Each manifold has ten nozzles that extend into the tubes to supply the gas for evaporation. This allows up to 50 samples to be processed simultaneously. If you have less than 50 samples, you activate only those rows where samples are located.

Flexibility

Evaporation can be paused, stopped, or resumed at any time. Time and temperature settings, and the selection of a row of tubes can be changed at any time.

Requires No Hood

The hinged cover and exhaust system permit benchtop use and save valuable hood space.

Accessories

Most of the hardware needed for installing and using the evaporator is provided. Racks and tubes are ordered separately. There are several rack sizes to choose from, including:

- two types of 16 mm x 100 mm tube racks,
- two types of micro-centrifuge tube racks,
- two types of 15 mL conical bottom centrifuge tube racks,
- 10 mm x 75 mm tube racks,
- 12 mm x 75 mm tube racks,
- 13 mm x 100 mm tube racks,
- 16 mm x 125 mm tube racks,
- 20 mm x 150 mm tube racks, and
- 10 mL conical bottom centrifuge tube racks.

TurboVap LV Hardware

TurboVap LV - Front

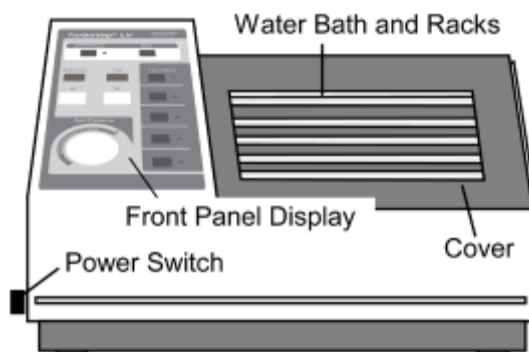


Figure 3. TurboVap LV Hardware, Front View

Front Panel

Controls the setup and operation of the evaporator. See [“Front Panel Controls” on page 15](#) for details.

Water Bath and Racks

The racks hold the sample tubes in the temperature-controlled water bath. Racks are available for many commonly-used tubes. See [“Replacement Parts” on page 39](#) for a list of supported racks and tubes.

The water bath operates over a temperature range of ambient to 90°C.

The TurboVap LV evaporator is not designed to cool, but the water bath temperature can be brought down as much as 15°C by using the evaporation as a cooling source. Cooling ability varies with the evaporation rate.

WARNING



Fire and burn hazard. DO NOT operate the TurboVap LV without water in the water bath.

Cover

Operation automatically pauses when the water bath cover is opened and resumes when the cover is closed. After an evaporation, open the cover to prevent condensation within the unit.

Power Switch

Turns the power on or off.

WARNING



- *The power switch is an arcing source and could ignite excessive explosive vapors if present.*
- *DO NOT change the position of the unit's on/off power switch when explosive vapors are present.*

TurboVap LV - Rear

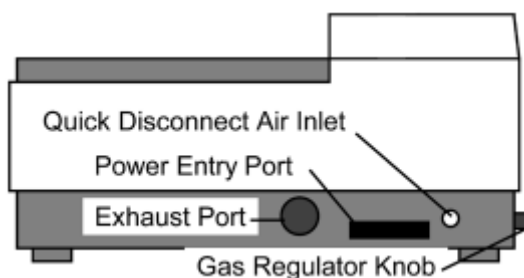


Figure 4. TurboVap LV Hardware, Rear View

Quick Disconnect Air Inlet

The evaporator has a gas supply inlet on the back of the unit. The fitting has an internal shutoff which allows you to disconnect the evaporator from the air or gas supply without turning off the gas supply itself.

WARNING



- *To avoid injury to yourself or damage to the instrument, DO NOT exceed 100 psi maximum inlet pressure.*
- *Never use hydrogen or other flammable gases. The wrong gas may explode or catch on fire.*

Power Entry Port

Houses the fuses and power cord connector.

WARNING



- *To avoid the risk of fire or electrical shock, plug the power cord securely into a properly grounded outlet.*
- *Replace fuses ONLY with the same type and rating.*

Exhaust Port

Solvent vapors are removed by an exhaust fan and routed to the exhaust port on the back of the unit. You must route the venting hose from the exhaust port to a proper ventilation system venting to the outside. The TurboVap LV's design ensures that vapors are properly contained and are removed automatically from the laboratory environment when the system is operating properly.

WARNING



- *Exhaust gases may be hazardous. Consult the Material Safety Data Sheets (MSDS) for all of the solvents used.*
- *Exhaust gases exiting the exhaust port can be harmful to your health and can contaminate the surrounding air. Use the exhaust hose provided to vent the gas to a hood or other ventilation device. If possible place the unit under a hood.*
- *DO NOT operate the unit if the exhaust system is not working properly.*

Gas Regulator Knob

Set the external gas supply to the instrument to be between 60 psi and 100 psi. Use the regulator knob to adjust the internal pressure (0 to 20 psi) for a desired helical gas flow directed at each of the sample tubes. The pressure gauge on the front panel displays the internal gas pressure.

The gas is routed through a stainless steel manifold to each sample tube.

WARNING



- *To avoid injury to yourself, damage to the instrument, or loss or samples, DO NOT exceed 20 psi maximum gas pressure in the TurboVap LV.*
- *Never use hydrogen or other flammable gases. The wrong gas may explode or catch on fire.*

Alarm Volume Control

The Alarm Volume control knob is located on the back of the TurboVap LV. Turn the knob in either direction to change the volume of the alarm.

- A repeating beep indicates a completed run.
- A long beep indicates interrupted operation.
- A short beep indicates a recognized key input.

Front Panel Controls

The control panel allows you to control evaporation in one to five rows of 10 tube positions. (Samples are not required in each position.) The microprocessor constantly monitors the control panel, allowing you to make changes to the panel settings at any time during evaporation. Yellow lights indicate the row(s) of tubes selected. The green light to the right of the START/PAUSE button is on when an evaporation is in progress and blinks when the evaporation has been paused. A STOP button on the control panel allows for termination of the evaporation process. The control panel also has two displays: one indicates time remaining; the other indicates the actual water bath temperature. These displays also provide diagnostic codes when an error is detected.

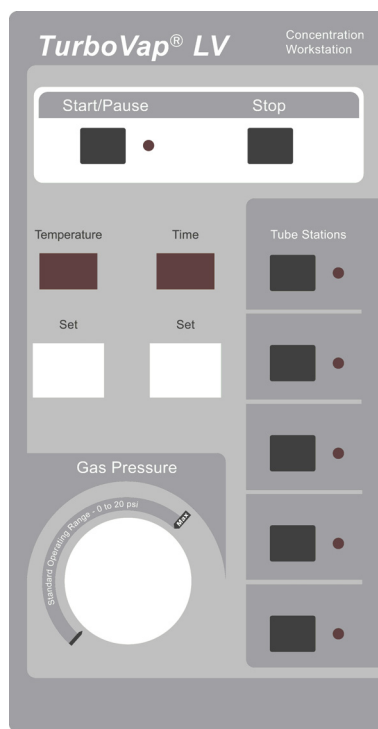


Figure 5. TurboVap LV Control Panel

Start/Pause Button

- If no evaporation is in progress, press once to start.
- If an evaporation is in progress, press once to pause.
- If an evaporation is paused (the green light is blinking), press once to continue.

Green Status Light

- BLINKING - evaporator is paused
- ON - evaporation in progress

Stop Button

- Press the Stop button to stop an evaporation in progress.
- Hold the Stop button IN when turning on the power to display the time in hours.

Temperature Display

Shows the temperature of the water bath in degrees Centigrade. The Temperature display BLINKS if the temperature is 2 or more degrees different from the set temperature.

Time Display

The Time Display indicates the run time remaining in either minutes (default) or hours (if the Stop button is held in when the power is turned on). Up to 9.9 hours are displayed with a decimal point.

- Displays the time remaining in minutes or hours during an evaporation.
- Displays - - upon power up or after a power failure.
- Displays == if set to zero for continuous evaporation.
- Display BLINKS when an evaporation is paused or stopped.

See [“Control Panel Troubleshooting” on page 34](#) for the details of fault conditions displayed in the TIME display.

Set buttons

Use the Set buttons for the Temperature and Time to set the desired water bath temperature and the length of time needed for the evaporation. Press the button above a digit to increase the value by one, or press the button below a digit to decrease the value by one.

Gas Pressure Gauge

Displays the internal gas pressure in psi. The gas pressure control knob on the left side of the unit regulates the internal gas pressure.

WARNING



To avoid injury to yourself, damage to the instrument, or loss or samples, DO NOT exceed 20 psi maximum gas pressure in the TurboVap LV.

Tube Stations Buttons

Press a Tube Stations button to select the rows of tubes that you want to circulate gas through during the evaporation. The buttons are immediately to the right of each of the five rows of ten sample tube locations. The yellow indicator light is ON when the row of tubes is selected.

Front Panel Indicator Light Signals:

GREEN Light ON and TIME Display Blinking:

The evaporation is paused. Press **Start/Pause** once to resume operation OR press **Stop** to abort.

GREEN Light OFF and TIME Display Blinking:

Evaporator has been stopped and cannot resume. Press **Start/Pause** to start over at the time indicated by the **Time** pushwheel.

TIME Display Shows — —

Evaporator has just been turned on, or a power failure occurred.

TIME Display Shows ≡≡

Evaporator **Time** pushwheel has been set to zero for continuous evaporation.

Installation

The Biotage TurboVap LV Evaporator includes most of the parts required for installation and operation. The desired tubes and racks must be ordered separately. [“Contact Biotage 1-Point Support”](#) for a list of the racks and tubes available.

Unpacking the TurboVap LV

Unpack the evaporator and verify that all parts listed below are included.

The TurboVap LV weighs over 40 pounds. Be careful when lifting the TurboVap LV.

Parts Supplied

The TurboVap LV includes the following parts:

- Evaporator Unit
- Power Cord(s) - 220V models include two power cords, one for EU and one for UK
- Reference Card
- User's Manual CD and Brochures
- Venting Hose (12.5')
- Clear Bath Kit
- Coupling Insert
- Bag with two 1/4" barb fittings (1/8" NPT and 1/4" NPT)
- 1/4" ID gas tubing
- Siphon

Other Required Items

- Biotage Test Tube Rack (one rack, customer's choice, ordered separately)
- Startup Glassware (Note: may be ordered/shipped separately)
Startup Glassware for **I-Chem TurboVap LV** must be purchased separately from Dionex at 1-800-346-6390.
- Inert Gas Supply (nitrogen)
- Regulator for gas line
- 1 Liter Distilled Water
- Timer

Site Preparation Requirements

You must have an appropriate location with available gas and electrical sources and adequate ventilation as specified by these site preparation requirements before installing the TurboVap LV evaporator.

Space:

Minimum bench space for the evaporator and any accessories

- Height: 12 inches (30.5cm)
- Width: 21.2 inches (53.8cm)
- Depth: 12 inches (30.5cm)
- Height with Cover Open: 20 inches (50.8cm)

Work Area:

Flat, level, stable surface

Compressed Gas Supply:

Clean, dry, unrestricted, inert air or nitrogen, etc., regulated to 60 psi minimum, 100 psi maximum

Biotage suggests using the supplied tubes and fittings. Devices added to the inlet supply line (such as moisture traps or filters) must not drop the pressure below 60 psi (4.1 bars).

WARNING



- *To avoid injury to yourself or damage to the instrument, DO NOT exceed 100 psi maximum compressed gas supply pressure.*
- *Never use hydrogen or other flammable gases. The wrong gas may explode or catch on fire.*

Exhaust Duct:

2 inch venting hose (exhaust duct is supplied with the unit). The exhaust duct MUST go to a suitable ventilation system vented outside the laboratory.

WARNING



Exhaust gases may be hazardous. Consult the Material Safety Data Sheets (MSDS) for all of the solvents used.

Power:

100/120VAC model	220/240 VAC model
100/120VAC +/- 10%	220/240 VAC +/- 10%
50 - 60 Hz	50 - 60 Hz

Fuses:

100/120VAC: (1) 10A, T250V (P/N 39164)

220/240 VAC: (2) 5A, T250V (P/N 44412)

Bath Capacity:

6.4 L maximum distilled water. DO NOT Overfill.

WARNING

Burn hazard. DO NOT move the unit when the bath is full of water.

Fitting:

For connection of gas supply to fit 1/4" ID gas tubing

Clear Bath™ Additive:

2 oz. kit supplied with unit

WARNING

Exposure to liquids may cause bacterial or viral hazards. Liquids can also be corrosive, flammable and/or toxic. Use good laboratory operating procedures when dealing with liquids. Refer to the MSDS (Material Safety Data Sheet) for detailed information.

- *Avoid direct contact with liquids.*
- *Wear protective gloves and safety glasses.*
- *Dispose of liquids and containers properly.*
- *Do not overfill containers.*

Installing the TurboVap LV

Select the Location

Select a flat, stable, dry bench space within 12 feet of adequate ventilation, and available sources of electricity and gas.

A laboratory hood is an ideal location for installation of the TurboVap, but any location adequately vented through a proper ventilation system to the outside is acceptable. **DO NOT** vent the TurboVap through a trap.

Connect the Gas Supply

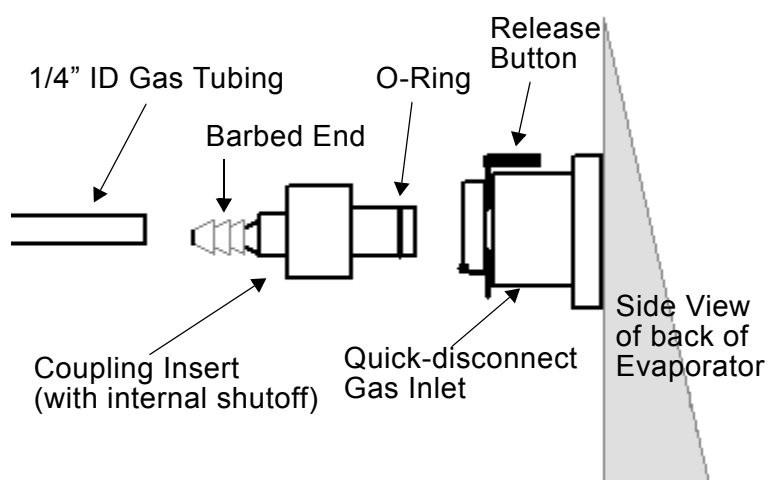


Figure 6. Connecting the Gas Supply

To connect the gas supply:

- 1 Turn off the gas supply.
- 2 Connect one end of the 1/4" ID gas tubing to the gas supply and connect the other end to the barbed fitting on the Coupling Insert.

WARNING



Fire and explosion hazard. Do NOT connect any type of flammable gas to the gas inlet.

- 3 Snap the Coupling Insert (O-ring end) into the Quick-Disconnect Gas Inlet on the back of the evaporator.

Connect the Gas Supply (Continued)

- 4 Turn on the gas supply.

WARNING



To avoid injury to yourself or damage to the instrument, DO NOT exceed 100 psi maximum inlet pressure.

Connect the Exhaust Tubing

If the evaporator is not placed in a hood:

- 1 Slide one end of the venting hose over the exhaust port.
- 2 Route the hose to a suitable external air ventilation system or hood. Ensure that the ventilation system is operating whenever the TurboVap is in use.

WARNING



Gas fumes can contaminate the air you breathe. Maintain proper ventilation at all times.

Fill the Water Bath

Before you fill the TurboVap LV Evaporator with distilled water, decide on the final height of the water:

- The water level should be AS HIGH AS the initial solvent level in the sample tubes, unless you are using micro-centrifuge tubes.
- If you are using micro-centrifuge racks and tubes, fill the water bath so that the water just touches the black top plate when the micro-centrifuge tubes are in place. This avoids splashing water into the samples.

To fill the water bath:

- 1 Open the cover and pour about 1 L of distilled water into the bath.
- 2 Add 15 drops of Clear Bath.
- 3 Add distilled water until the water's surface is at the desired height.

WARNING

To avoid the risk of fire or burn injuries, do NOT operate the TurboVap LV without water in the bath.

Place the Rack Assembly into the Water Bath

The handles on standard test tube racks are aligned vertically with the sides of the rack. Follow the instructions below to install and align the racks.

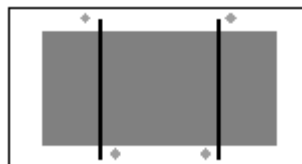


Figure 7. Standard Biotage Rack

To Install a standard Biotage Rack:

- 1 Standard Biotage racks only fit into the water bath one way. Position the rack so that the handles are vertical. Look at the holes on both long edges of the rack and orient the rack so that the holes that are closer together are toward the front.
- 2 Gently lower the rack into the bath.

Align the Nozzles

- 1 Place one test tube into each row and close the cover.
- 2 Observe the position of the nozzle over the test tube. Each nozzle should be adjusted as far to the left as possible within the test tube, but not touching the side of the tube as shown in [Figure 8 on page 24](#).
- 3 If adjustment is necessary, open the cover, loosen the screws on each end of the nozzle row that needs adjusting, adjust as necessary, and retighten the screws. Close the cover and verify the nozzle position. Continue to adjust as necessary.

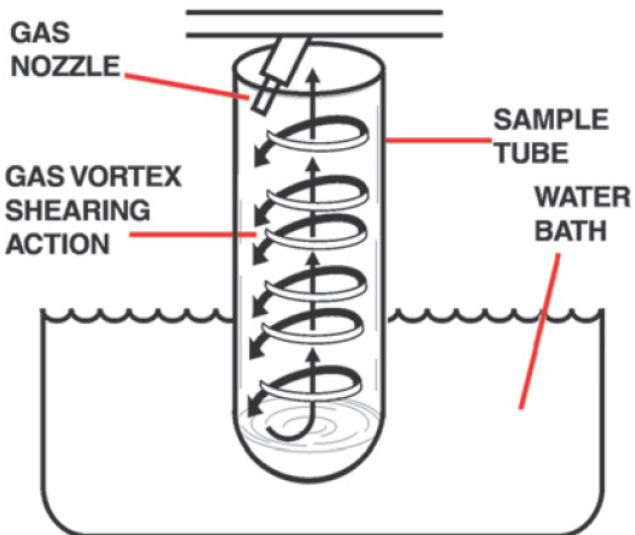


Figure 8. Nozzle Adjustment

Connect the Power Cord

- 1 Plug the power cord securely into the receptacle on the back of the unit. Make sure the plug is fully inserted.
- 2 Connect the 3-pronged end to an appropriate power source.

WARNING



To avoid the risk of fire or electrical shock, plug the power cord into a properly grounded outlet.

Turn On the Power

To turn on the evaporator, turn on the power switch located on the lower left side of the TurboVap. When the power is turned on, the Power-Up diagnostics described below will run automatically.

Power-Up Diagnostics

When power is first turned ON, the following diagnostics occur:

Display Test - During the first four seconds after power up, all display lights are lit. Confirm that no lights are out.

Also during this time, raising and lowering the cover sounds the beeper in confirm the cover switch is functioning.

Normal operation begins after four seconds.

Determine Optimal Concentration Conditions

You should determine the settings that will best concentrate the samples before operation. You should determine the desired:

- water bath temperature
- gas pressure
- endpoint selection.

To prepare the TurboVap LV:

- 1 Turn the evaporator's power ON. The unit should always be ON whenever it contains samples so that the fan can remove exhaust.
- 2 Turn the gas supply ON.
- 3 Set the pressure on the gas supply regulator to 0 (zero) psi.
- 4 Remove all tubes from the evaporator.

Determine Appropriate Water Bath Temperature

Since the concentrator's high evaporation rates eliminate the need for a high temperature water bath, the bath operates over a mild temperature range of ambient to 90°C. This eliminates hot spots and improves sample recovery for more volatile compounds. The water bath also can be brought down below room temperature by using evaporative cooling. Cooling ability varies with the concentration rate.

Set the water bath temperature with the **Temperature** set buttons and allow the bath to come up to temperature. Allow 20 to 30 minutes for the bath to reach the desired temperature. The temperature display blinks until the bath reaches the specified temperature.

When selecting a water bath temperature, remember that faster evaporation occurs as the water bath temperature increases. BE AWARE that highly volatile samples can be lost if allowed to sit for extended periods of time in a warm bath.

NOTE



OPEN THE COVER after running an evaporation to prevent condensing steam from the water bath from running off the cover and dripping into sample tubes.

Determine Appropriate Gas Pressure & Time Settings

Several variables, including tube size, sample volume, and solvent boiling point, influence the settings needed for each evaporation.

NOTE: 10 mL of methylene chloride at 35°C should evaporate to dryness in 21 minutes at 15 psi using standard 16 mm x 100 mm tubes. Once this rate is achieved, sample recovery can be optimized by fine-tuning the water bath temperature and gas pressure.

NOTE: Water bath temperature fluctuations of 2 to 4°C are normal during standard operation.

- 1 Pull the regulator knob out and turn it fully counterclockwise to start at a pressure of zero.
- 2 Place a sample tube with the approximate amount of solvent you want to evaporate into a rack position.
- 3 Set the **Time** to 00 (zero).
- 4 Select the row containing the sample tube by pressing the corresponding **Tube Stations** button. (Choose the button that aligns horizontally with the row.)
- 5 Press the **Start** button.
- 6 Slowly turn the Gas Pressure knob clockwise to increase the gas pressure (to approximately 10 to 15 psi) until a swirling action (without splashing) is observed inside the test tubes.
- 7 Using a stopwatch or clock, time how long it takes to evaporate the sample to dryness (or to the desired level).
- 8 Press the **Stop** button and record the time. If necessary, make changes to water bath temperature and/or gas pressure and repeat the timing process.
- 9 Record the optimized temperature, gas pressure, and time. Use these settings for daily operation.

Operation

This section describes how to operate the Biotage TurboVap LV Evaporator using the following procedures:

- 1 [“Preparing the Unit”](#) (see below)
- 2 [“Setting the Water Bath Temperature”](#) (see below)
- 3 [“Setting the Gas Pressure”](#) (see below)
- 4 [“Setting the Time”](#) (see [page 28](#))
- 5 [“Selecting the Tube Rows”](#) (see [page 28](#))
- 6 [“Loading the Samples”](#) (see [page 28](#))
- 7 [“Starting the Evaporation”](#) (see [page 28](#))
- 8 [“Stopping the Evaporation”](#) (see [page 29](#))
- 9 [“Removing the Samples”](#) (see [page 29](#))

Preparing the Unit

Prepare the evaporator by performing the following steps:

- 1 Check the water level in the water bath. It should be at least as high as the initial solvent level in the sample tube. If you are using micro-centrifuge racks and tubes, the water should just touch the black top plate when the micro-centrifuge tubes are in place.
- 2 Check that the incoming gas supply is turned on and has sufficient reserve for the sample run.
- 3 With the cover closed, turn the TurboVap power ON.

Setting the Water Bath Temperature

To set the water bath temperature:

- 1 Press the Set buttons on the **Temperature** pushwheel until the pushwheels display the desired temperature (see [“Determine Appropriate Water Bath Temperature”](#) on [page 25](#)).
- 2 Wait until the bath reaches the set temperature (the Temperature display stops blinking), approximately 20 minutes.

Setting the Gas Pressure

- 1 Set the gas pressure to the desired setting (see [“Determine Appropriate Gas Pressure & Time Settings” on page 26](#)).

Setting the Time

To set the evaporation time:

- 1 Press the Set buttons on the **Time** pushwheel until the pushwheels display the desired time (see [“Determine Appropriate Water Bath Temperature” on page 25](#)). The Time display is in minutes (default) or hours (if the Stop button is held in when the power is turned on). Up to 9.9 hours are displayed with a decimal point.

Setting the Time to 00 causes the evaporator to continue running until you press the Stop button.

Selecting the Tube Rows

To select the rows that contain sample tubes:

- 1 Press the **Tube Stations** button for each row that will contain samples.

Loading the Samples

- 1 Open the cover.
- 2 Place the filled sample rack into the water bath.

WARNING



Burn hazard. Water in the bath may be as hot as 90°C.

- 3 Close the cover.

Starting the Evaporation

- 1 Press the **Start/Pause** button. The evaporation begins.

Display During Operation

During the evaporation, the Temperature display shows the temperature of the water bath in degrees Celsius and the Time display shows the time remaining in minutes or hours.

The Time display shows $\equiv$ if set to zero for continuous evaporation or BLINKS when an evaporation is paused or stopped.

Stopping the Evaporation

When the evaporation time expires, the gas automatically turns off and the alarm sounds every 30 seconds.

To stop the evaporation before time expires or if the time is set to 00, press the Stop button. The remaining time is automatically cleared.

To pause the evaporation, lift the cover. The evaporation can be resumed with the correct remaining time by closing the cover. (The remaining time is not cleared.)

To turn off the evaporation in any row, press the corresponding **Tube Stations** button.

Removing the Samples

- 1 To remove the rack, carefully lift the rack out of the bath to drain. Blot rack and tubes with an absorbent material to remove moisture as desired.

Note: Prompt removal of the rack is important since

- highly volatile compounds can be lost if allowed to sit for an extended period of time.
- steam from the water bath could condense on the cover and may drip into sample tubes if they are left in place.

WARNING



- *Avoid spilling solvents into the water bath. If solvents do spill into the water bath, follow MSDS safe handling instructions and immediately change the water in the water bath. Rinse the unit with distilled water. Refer to MSDS (Material Safety Data Sheets).*
 - *To avoid injury to yourself or damage to the instrument, handle broken glass (broken tubes) with care.*
- 2 Turn the unit power and the gas supply OFF.
 - 3 Lift the cover and leave it open.
 - 4 Complete the appropriate maintenance routine. (See [“Maintenance” on page 30.](#))

Maintenance

This section of the manual includes:

- “Cleaning the Water Bath” on page 30
- “Replacing the Fuses” on page 32
- “Preventive Maintenance Routine” on page 33
- “Long Term Storage” on page 33

Cleaning the Water Bath

Clear Bath (water bath growth retardant) helps eliminate the need for frequent cleaning. To prevent cloudy water in the water bath, clean the bath regularly.

Supplies required:

- Siphon tube
- SPECTRUM Clear Bath
- Cleaning supplies.

To clean the water bath:

- 1 Turn the evaporator's AC power OFF and unplug the power cord.

WARNING



To avoid the risk of burn injury or electrical shock, turn OFF power and unplug the power cord before servicing or cleaning the unit.

- 2 Open the evaporator's cover and remove the rack.
- 3 Siphon the water out of the bath.
- 4 Use an appropriate cleaner to wipe any residue from the bath walls. Rinse the bath and re-siphon the liquid.
- 5 Clean the rack.
- 6 Pour about one liter of distilled water into the bath.
- 7 Add 15 drops of Clear Bath.

Cleaning the Water Bath (Continued)

WARNING



Exposure to liquids may cause bacterial or viral hazards. Liquids can also be corrosive, flammable and/or toxic. Use good laboratory operating procedures when dealing with liquids. Refer to the MSDS (Material Safety Data Sheet) for detailed information.

- *Avoid direct contact with liquids.*
 - *Wear protective gloves and safety glasses.*
 - *Dispose of liquids and containers properly.*
 - *Do not overfill containers.*
- 8** Add distilled water until the water's surface is at the recommended height for the evaporation.
 - 9** Plug in the power cord and turn the power ON. Select the desired temperature and allow 20 to 30 minutes for the bath to reach temperature.

Replacing the Fuses

Fuse Requirements:

100/120VAC model	220/240 VAC model
(1) 10A, T250V (P/N C39164)	(2) 5A, T250V (P/N C44412)

WARNING



- *Electrical shock hazard. Disconnect the power supply before changing the fuses.*
- *For continued fire protection, replace fuses only with ones of the same type and rating.*

To change the fuses:

- 1 Turn OFF the AC power and unplug the power cord.
- 2 Locate the Power Entry Port fuse holder on the side of the unit. 220/240V units have two fuse holders in the power entry port. Always replace both fuses at the same time.
- 3 Use a flatblade screwdriver to turn the fuse holder(s) from horizontal to vertical as shown in [Figure 9](#).

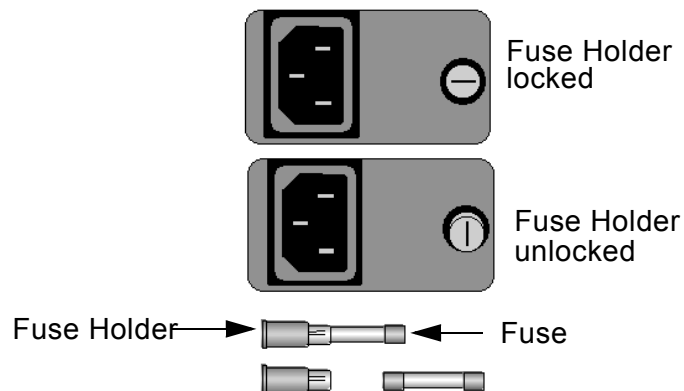


Figure 9. Replacing the Fuses

- 4 Remove the fuse holder and fuse.
- 5 Remove the fuse from the fuse holder and replace it with one of the same type and rating.
- 6 Replace the fuse holder in the power entry port.
- 7 Plug in the power cord and turn on the power.

Preventive Maintenance Routine

Panel

Avoid contact with solvents and remove dirt buildup on the control panel. To clean, use a mild cleaning solution on a damp cloth. Do not spray cleaner directly onto the control panel.

Exterior

Clean exterior surfaces with a damp cloth and mild cleaning solution when necessary.

Cover

Keep cover clean and do not use the cover as a shelf. Lift cover when unit is turned off to keep moisture from accumulating.

Water Bath

Maintain a water level approximately equal to or greater than the initial level of solvent in the tubes.

Monitor the cleanliness of the bath and clean the bath using the cleaning procedure on [page 30](#).

Gas Supply

Periodically check gas hose and fittings for leaks.

Exhaust Port

Periodically check for leaks in hose. Replace if necessary.

Long Term Storage

If the TurboVap will be stored for an extended period of time:

- 1 Turn the unit off and unplug the power cord.
- 2 Remove all glassware.
- 3 Turn off and disconnect the air/gas supply.
- 4 Empty the bath.
- 5 Wipe the bath walls with an appropriate cleaner. Rinse and re-siphon the water from the bath.
- 6 Remove, clean, and replace the rack.
- 7 Leave the cover open until the inside is completely dry.
- 8 When dry, close the cover.
- 9 Cover the unit to prevent dirt or dust accumulation.

Troubleshooting

To establish the cause of unexpected behavior, review the tables below.

Control Panel Troubleshooting

Symptom	Probable Cause	Solution
Temperature display blinking	Temperature not in range	Allow more time to reach temperature. Contact Biotage Technical Support if blinking continues.
Time displays two blinking dashes	Power failure occurred	Evaluate status of evaporation, reset time, and restart.
Time displays 2 sets of 3 dashes	Time pushwheel set to zero for continuous evaporation	Set Time if desired.
"lo" blinks on Temperature display	Bath temp < -9°C	Contact Biotage Technical Support.
"hi" blinks on Temperature display	Bath temp. > 100°C	Contact Biotage Technical Support.
Yellow Tube Stations light does not light but manifold for that row works	Faulty light	To replace the panel, call Biotage Technical Support.
Yellow Tube Stations light does not light and manifold for that row does not work	Faulty switch	To replace the switch, call Biotage Technical Support.
Temperature or Time display does not work	Faulty display board	To replace the panel, call the Biotage Technical Support Center.
Temperature or Time pushwheel does not work	Faulty pushwheel switch	To replace the switch, call the Biotage Technical Support Center.
Time display shows decimal point	This is normal when the Stop button is held at power up. A decimal point in the Time display indicates time in hours.	To display time in minutes, turn on the unit without holding the Stop button.

Symptom	Probable Cause	Solution
Time display does not display hours	Did not hold Stop button when turning power on	To display time in hours, turn on the unit while holding the Stop button.

Manifold Troubleshooting

Symptom	Probable Cause	Solution
No evaporation in a row of tubes	Faulty gas valve for that row Nozzles not aligned properly	Call the Biotage Technical Support Center. See “Align the Nozzles” on page 23 .
No evaporation	Blocked nozzle in one tube	Call the Biotage Technical Support Center.

Water Bath Troubleshooting

Symptom	Probable Cause	Solution
Turbid water	Bacterial growth in the water	Clean the water bath and add Clear Bath.

Power Troubleshooting

Symptom	Probable Cause	Solution
No power to unit	a. Power switch is OFF b. Loose power cord c. Bad fuse	a. Check that the power switch is on. b. Check that the power cord is secure. c. Replace the fuse (see page 32).

Gas Supply Troubleshooting

Symptom	Probable Cause	Solution
Excessive gas consumption	a. Leaks in the gas tubing b. Leaks in the fittings	Apply soapy solution at connections and check for leaks. Replace hose or fittings if necessary.
Evaporation incomplete	a. Clogged air path b. Faulty gas valve	Contact the Biotage Technical Support Center.

Evaporation Troubleshooting

Symptom	Probable Cause	Solution
Evaporation rate too slow	a. Temperature set too low b. Gas pressure too low c. Nozzles not adjusted properly	a. Increase water bath temperature. b. Increase gas pressure. c. See “Align the Nozzles” on page 23 .
Evaporation rate too fast	a. Temperature set too high b. Gas pressure set too high	a. Decrease water bath temperature. b. Decrease gas pressure.
No gas flow	a. Out of gas b. Obstructed tubing	a. Check gas supply. b. Clear the blockage.
Gas does not turn off on ONE manifold	a. Faulty gas valve b. control board failure	a. Replace the valve b. Replace the control board
Gas does not turn off on ALL manifolds	Control board failure	Replace the control board.

Rack Troubleshooting

Symptom	Probable Cause	Solution
Tubes are not held in place when placed into the water bath	a. Gasket plates not adjusted properly b. Worn gaskets	a. Loosen the 8 screws on the top of the rack, slide the gasket plates closer to the tubes, and then tighten the screws. b. Replace the worn gaskets.

Specifications

Capacity: Fifty tubes

Containers and Working Volumes: (using different racks)

Containers:	Working Volumes:
10 x 75 mm tubes	up to 4 mL
12 x 75 mm tubes	up to 4 mL
13 x 100 mm tubes	up to 7 mL
16 x 100 mm tubes	up to 12 mL
16 x 125 mm tubes	up to 16 mL
20 x 150 mm tubes	up to 30 mL
10 mL conical bottom tubes	up to 10 mL
15 mL conical bottom tubes	up to 15 mL
15 mL volumetric conical bottom tubes, (compatible with the AutoTrace SPE Workstation)	up to 15 mL
1.5 - 2.0 mL micro-centrifuge tubes, (screw cap type)	1.5 to 2 mL
1.5 - 2.0 mL micro-centrifuge tubes, (flip cap type)	1.5 to 2 mL

NOTE: Evaporate full sample tubes with care to prevent splashing.

Environmental:

Operating Temperature	59° to 95°F (15° to 35°C)
Operating Humidity	0% to 85% relative humidity, non-condensing
Storage Temperature	50° to 122°F (10° to 50°C)
Storage Humidity	0% to 85% relative humidity, non-condensing
Altitude	Up to 2000M
Indoor Use Only	

Power:

Input Voltage	100/120VAC +/- 10% 220/240 VAC +/- 10%
Line Frequency	50 - 60 Hz
Fuses	100/120VAC: (1) 10A, T250V (P/N C39164) 220/240 VAC: (2) 5A, T250V (P/N C44412)

Typical Evaporation:**Rates**

Solvent	Time (min.)
Ethyl Acetate	17.5
Hexane	9
Methanol	25.5
Methylene Chloride	17

* **Conditions:** 10 mL of solvent evaporated to dryness at 52°C.
Methylene chloride bath temperature at 38°C.

Gas Consumption: 1 cfm per row of nozzles at 15 psi
(from a source capable of supplying 60 to 100 psi.)

Water Bath Temperature Range: ambient to 90°C

Gas Regulator and Gauge Range: 0 to 30 psi

WARNING

To avoid injury to yourself, damage to the instrument, or loss of samples, DO NOT exceed 20 psi maximum gas pressure in the TurboVap LV. Do not set the regulator to the maximum of 30 psi.

Dimensions: Height: 11.9" (30.2cm)

Width: 21.2" (53.8cm)

Depth: 11.9" (30.2cm)

Height with Cover Open: 20 inches (50.8cm)

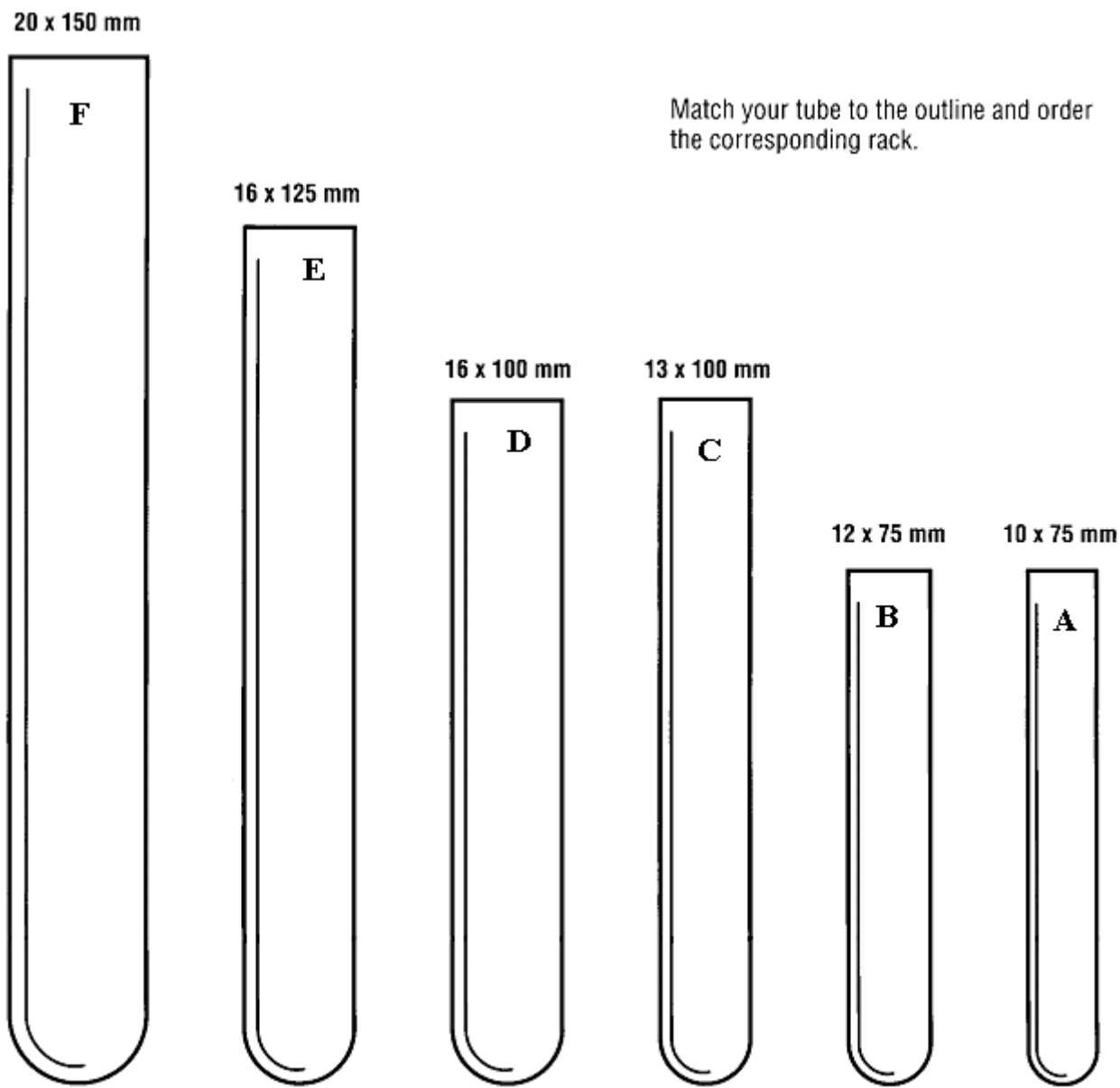
Weight: 40.5 lbs. (18.47 Kg.) - empty water bath

Time Range: 1 to 99 min. or 0.1 to 9.9 hrs. - can also be set to 00 for infinite time

***** NOT for in vitro testing *****

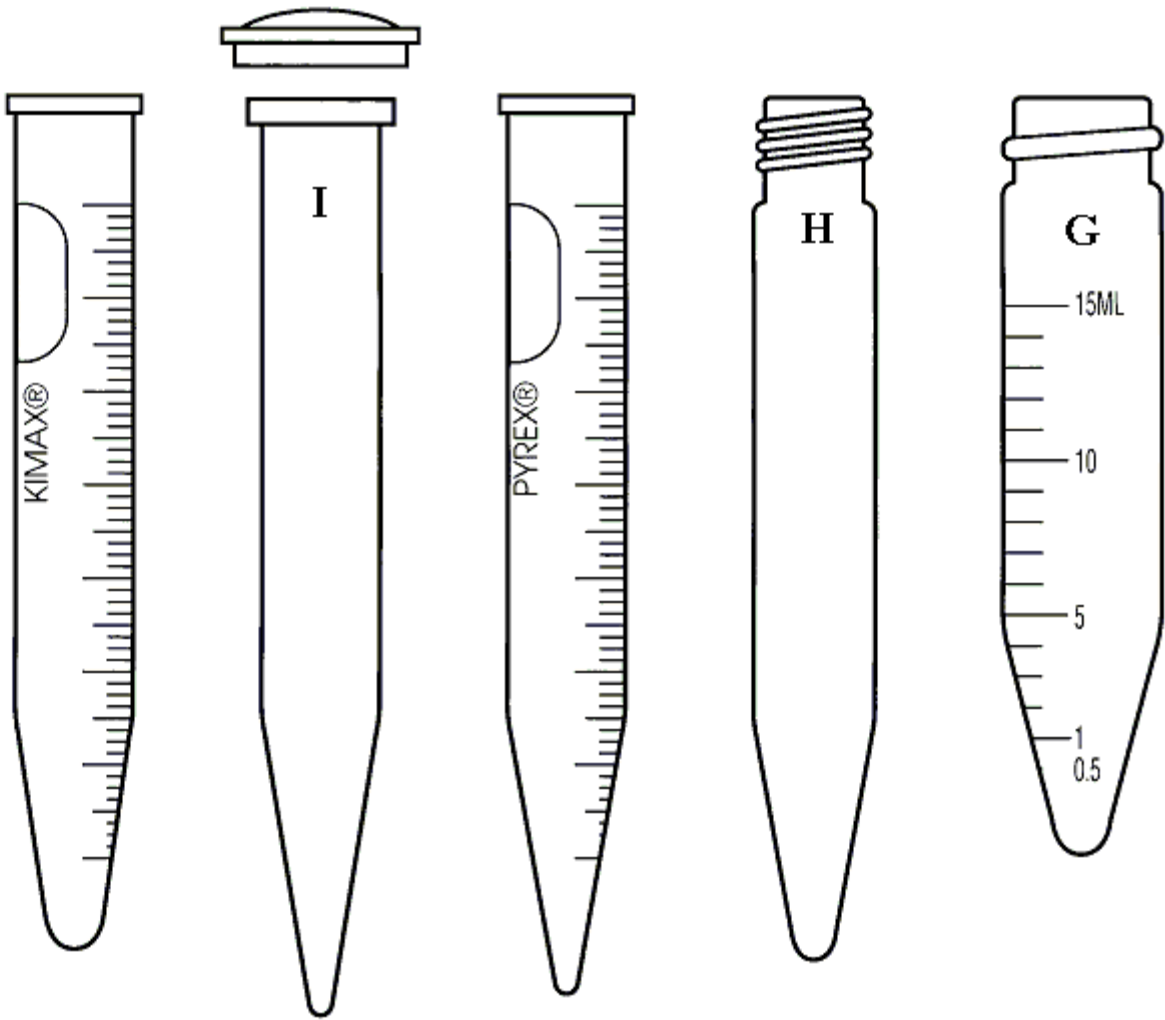
Replacement Parts

Units and Racks	Part Number
1.5 - 2.0 Microcentrifuge Flip Cap Tube Rack - recommended suppliers of tubes: Eppendorf, National Scientific, & Bio Plas (see page 44) (Tubes not included)	C48928
1.5 - 2.0 Microcentrifuge Screw Cap Tube Rack - recommended suppliers of tubes: Eppendorf, National Scientific, & Bio Plas (Tubes not included)	C48929
10 x 75 mm Tube Rack - capacity: 50 tubes. (use C48985 tubes)	C48950
12 x 75 mm Tube Rack - capacity: 50 tubes. (use C44651 tubes)	C44577
13 x 100 mm Tube Rack - capacity: 50 tubes. (use C40707 tubes)	C45286
16 x 100 mm Tube Rack - capacity: 50 tubes. (use C40708 tubes)	C44139
16 x 125 mm Tube Rack - capacity: 50 tubes. (use C45273 tubes)	C45269
20 x 150 mm Tube Rack - capacity: 50 tubes. (use C40709 tubes)	C44282
10 mL centrifuge Tube Rack - capacity: 50 tubes. (use C47811 tubes)	C47820
15 mL centrifuge Tube Rack - capacity: 50 tubes. (use C44941 tubes)	C44880
15 mL Volumetric Tube Rack for AutoTrace use - capacity: 50 tubes. (use C47816 tubes) (Tubes not included)	C47818



30 mL	16mL	12 mL	7 mL	4 mL	4 mL
C44282	C45269	C44139	C45286	C44577	48950

Snap Cap Reference #	Kimble #73837
Biotage P/N	C44942 (case of 500)



Tube Reference #	Kimble #45165	Kimble #73790	Corning #8080	Kimble #73785	Biotage #C47816
Maximum Volume	12 mL	12 mL	12 mL	10 mL	15 mL
Rack P/N	C44880	C44880	C44880	C47820	C47818

	Tubes and Caps	Part Number
A	10 x 75 mm tubes - 1000 tubes per case. (use rack C48950)	C48985
B	12 x 75 mm tubes - 1000 tubes per case. (use rack C44577)	C44651
C	13 x 100 mm tubes - 1000 tubes per case. (use rack C45286)	C40707
D	16 x 100 mm tubes - 1000 tubes per case. (use rack C44139)	C40708
E	16 x 125 mm tubes - 1000 tubes per case. (use rack C45269)	C45273
F	20 x 150 mm tubes - 500 tubes per case. (use rack C44282)	C40709
H	10 mL centrifuge tubes - 125 tubes per case. (use rack C47820)	C47811
I	15 mL centrifuge tubes - 125 tubes per case. (use rack C44880)	C44941
J	15 mL Volumetric tubes for AutoTrace use - 12 tubes per case. (use rack C47818)	C47816
	Snap caps for 15 mL centrifuge tubes (polypropylene) - 500 caps per case	C44942
	Nozzle Plugs (25/pkg) - for closing gas nozzles on manifold to conserve nitrogen.	C46811

Replacement Kits	Part Number
Electronics Cover Replacement Kit (with keypad)	C103208
Control Board Replacement Kit	C44477
Nozzle Manifold Replacement Kit	C44479
Rack Gasket Replacement Kit (10/pkg) for racks with flat gaskets	C44511
Solenoid Valve Replacement Kit	C44474
PTFE-coated Manifold Replacement Kit	C55941
Bath Replacement Kit	C46985

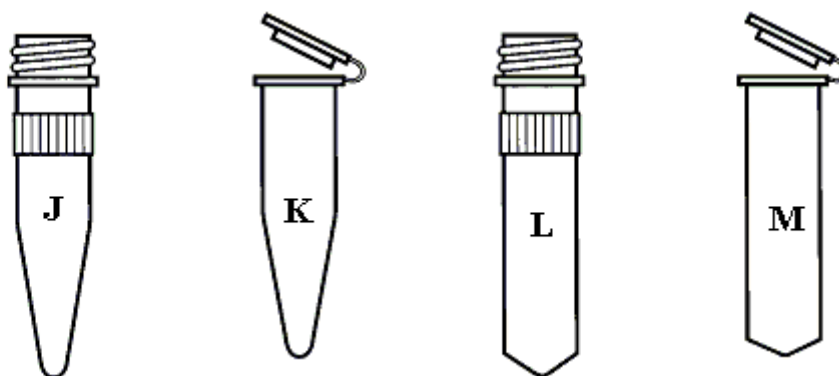
Spare Parts	Part Number
Fitting, ¼ barb x 1/8 male NPT - connects gas tubing to gas source. (for ¼ connection see C43145)	C38635
Fitting, ¼ barb x ¼ male NPT - connects gas tubing to gas source. (for 1/8 connection see C38635)	C43145
2 inch Venting Hose, 12.5 feet	C43067
Fitting, coupling, panel mount - gas inlet coupling on back of unit	C44015
Fitting, coupling, insert - connects gas tubing to inlet coupling	C44016
Fitting, 1/8 barb x 10/32 right angle - connects tubing to manifold	C44324
Sensor Actuator Magnet	C44111
Tubing Kit ¼ ID x 3/8 OD Bevaline, 10 feet (for plumbing the gas inlet line to the TurboVap)	C44504
Air Pressure Gauge	C66019
Air Regulator	C46337
Solenoid Valve Assembly	C43840
Glass Window for cover	C44137
Fan Assembly	C43767

Miscellaneous Items	Part Number
Water Bath Additive, Clear Bath - 8 oz. bottle	C44316
Bath Siphon	C46381

TurboVap LV-Compatible Micro-Centrifuge Tubes

The micro-centrifuge tubes listed in the chart below have been tested and found to be compatible for use in the TurboVap LV. Purchase these from your laboratory supply company as required.

Tube Example	Size	Tube Type	Cap Type	Manufacturer	Use Rack Part #
K	1.5 mL	Conical	Flip cap	Eppendorf	C48928
M	2.0 mL	Conical	Flip cap	Eppendorf	C48928
	1.7 mL	Conical	Flip cap	National Scientific	C48928
	2.0 mL	Conical	Flip cap	National Scientific	C48928
J	1.5 mL	Conical	Screw cap	Bio Plas Inc.	C48929
L	2.0 mL	Conical	Screw cap	Bio Plas Inc.	C48929
	2.0 mL	Conical/skirted	Screw cap	Bio Plas Inc.	C48929



Cap Type	Screw Cap	Flip Cap	Screw Cap	Flip Cap
Maximum Volume	1.5 mL	1.5 mL	2 mL	2 mL
Rack Part #	C48929	C48928	C48929	C48928

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