TurboVap®

User Manual

Biotage®

TurboVap®

User Manual

CONTENTS

System Overview

TurboVap® is a solvent evaporation system that can easily be modified between four different system configurations:

- TurboVap LV can process up to 48 samples in many types and sizes of tubes including centrifuge tubes and micro-centrifuge tubes.
- TurboVap II can process up to 6 samples in 50 or 200 mL evaporation tubes using a rack with or without end-point detection.
- TurboVap EH can process up to two Extrahera sample/collection racks with 24 samples (in each rack) in 12 x 75 mm, 16 x 75 mm, or 18 x 75 mm tubes.
- TurboVap P+ can process up to 48 samples in 12 x 75 mm, 12 x 100 mm, 13 x 75 mm, 13 x 100 mm, or 16 x 100 mm tubes.

Evaporation Modes

TurboVap enables you to:

- Evaporate until stopped manually.
- Evaporate for a set period of time.
- Evaporate until the end-point sensor detects a liquid level of 0.2 or 0.7 mL depending on the glassware. Each sample tube is controlled individually.
- Evaporate for a set period of time *after* the end-point sensor detects a liquid level of 0.2 or 0.7 mL depending on the glassware. Each sample tube is controlled individually.
- Evaporate using a step or ramp gradient of gas flow and time settings with a maximum of three segments.
- Evaporate using a combination of a gradient and end-point detection.

End-Point Detection

The TurboVap II rack with end-point sensors (see page 2) enables the system to automatically stop the evaporation in a rack position when the liquid level in the tube passes below the sensor. The final volume of the evaporation depends on the stem size of the tube. Evaporation tubes with a 0.5 mL stem concentrate to 0.2 mL, and tubes with a 1.0 mL stem concentrate to 0.7 mL. They all have a ±5% calibrated mark on the tube for you to reconstitute to 0.5 or 1.0 mL; see Figure 1.

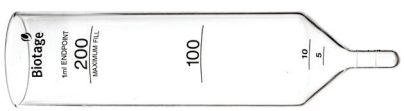


Figure 1. 200 mL evaporation tube with a 1.0 mL stem.

The end-point sensor tracks any slow changes in the optical density of the sample to assure that darkening or brightening of samples does not stop the evaporation prematurely. Once the sample solution passes below the end-point sensor, the system stops the evaporation in that rack position or continues to evaporate for the additional time. The racks with end-point sensors can be used at bath temperatures up to 60°C.

Manifolds

The manifold is selected according to the rack you want to use (see page 2). There are four manifolds to choose from:

- TurboVap LV manifold with 48 gas nozzles; see Figure 2. This manifold is used with the TurboVap LV multi racks. When using the rack with 24 positions, half of the nozzles must be plugged.
- TurboVap II manifold with 6 gas nozzles; see the left manifold in Figure 3. This manifold is used with the TurboVap II racks.
- TurboVap EH manifold with 2 x 24 gas nozzles; see the right manifold in Figure 3. This manifold is used with the TurboVap EH sample/collection rack holder.
- TurboVap P+ manifold with 48 gas nozzles; see Figure 4. This manifold is used with the TurboVap P+ racks.

Figure 2. TurboVap LV manifold with 48 nozzles (left). In the picture to the right, 24 nozzles are plugged for usage with the multi rack with 24 positions.

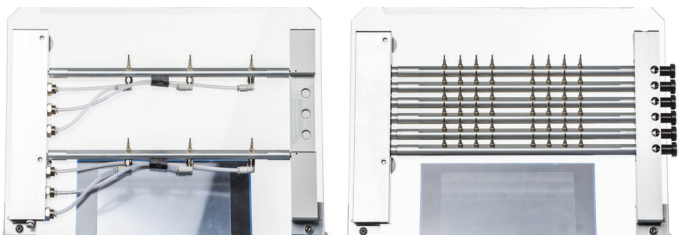


Figure 3. TurboVap II manifold with 6 nozzles (left) and TurboVap EH manifold with 2 x 24 nozzles (right).

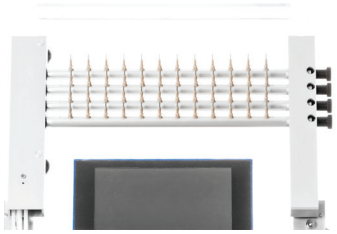


Figure 4. TurboVap P+ manifold with 48 nozzles.

In the software, it is possible to activate or deactivate each nozzle row (TurboVap LV, EH, or P+) or nozzle (TurboVap II) separately. If not using all rack positions in an activated nozzle row, single nozzles can be plugged. Note that the gas flow displayed in the software is always the gas flow per nozzle without any nozzles plugged. To get the correct gas flow for the installed manifold, the correct manifold setup must be selected in the software's settings view (see page 6).

Racks and Tube Sizes

The following TurboVap racks are available:

- TurboVap LV multi racks:
  - 48 positions for 10–16 mm (OD), <45 mm (length) mini vials.
  - 48 positions for 10–20 mm (OD), 75–165 mm (length) tubes (see left rack in Figure 5).
  - 24 positions for 21–32 mm (OD), 75–165 mm (length) tubes (see right rack in Figure 5).
- TurboVap II rack with or without end-point sensors; see Figure 6. The rack has 6 positions for 50 or 200 mL evaporation tubes with 0.5 or 1.0 mL end volume (C128506, C128507, C128508, and C128511). The TurboVap II racks come with cover plugs in two sizes, to cover the rack openings for 50 mL and 200 mL tubes respectively; see Figure 7. The plugs are used to reduce the amount of water evaporating from the water bath. It's recommended to cover any unused openings to minimize evaporation.
- TurboVap EH sample/collection rack holder with 2 positions for Extrahera sample/collection racks with 24 positions for 12 x 75 mm, 16 x 75 mm, or 18 x 75 mm tubes; see Figure 8.
- TurboVap P+ racks:
  - 48 positions for 16 x 100 mm tubes (see left rack in Figure 9).
  - 48 positions for 12–13 mm (OD), 75 or 100 mm (length) tubes (see right rack in Figure 9). When using 100 mm tubes, the "L75" plate has to be removed by removing the Torx screw (T10) on the left side and then pulling the plate out.

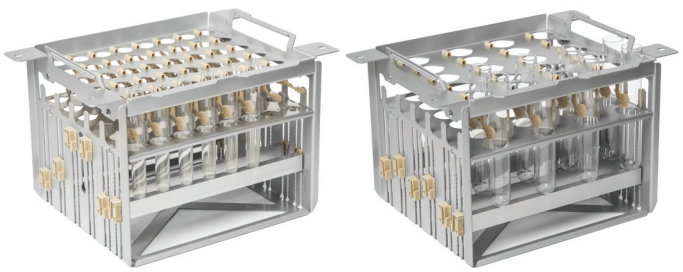


Figure 5. TurboVap LV multi racks with 48 positions (left) and 24 positions (right).

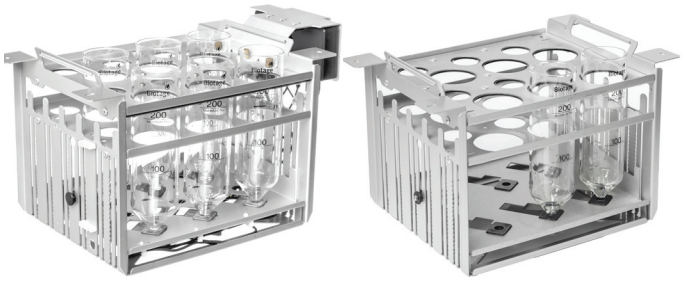


Figure 6. TurboVap II rack with (left) and without (right) end-point sensors.

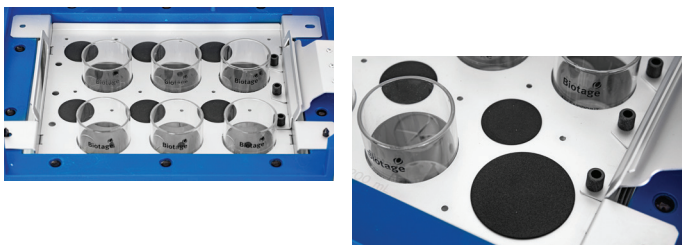


Figure 7. TurboVap II rack with cover plugs for 50 mL tube openings (left and right) and 200 mL tube openings (right).

Figure 8. TurboVap EH sample/collection rack holder (left) can hold two Extrahera sample/collection racks with 12 x 75 mm tubes (middle), 16 x 75 mm tubes, or 18 x 75 mm tubes (right).

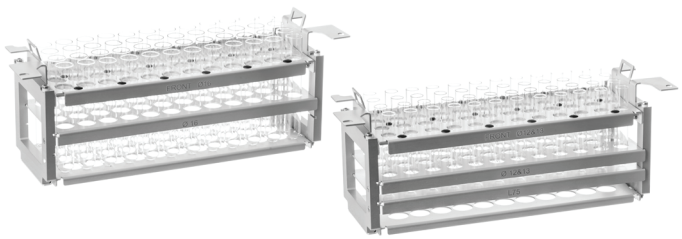


Figure 9. TurboVap P+ racks with 16 x 100 mm tubes (left) and 12 x 75 mm tubes (right). The rack to the right can also hold 12 x 100 mm, 13 x 75 mm, and 13 x 100 mm tubes.

Water Bath

The water bath operates over a temperature range from ambient to 90°C. Racks with end-point sensors can only be used at bath temperatures up to 60°C. The evaporation is automatically paused (the gas is turned off) when the lid is opened and resumed when the lid is closed.

The water bath must be kept clean and only be filled with deionized water. The bath can easily be emptied by connecting the drain tube supplied with the system to the drain port on the front right corner.

Gas Vortex Shearing Action

The system uses a gas vortex shearing action to maintain high evaporation rates under mild thermal conditions regardless of the sample height in the tube.

A helical flow (see Figure 10) is created by the stream of gas directed into each sample tube through the nozzles on the manifold. The helical flow sets up a vortex shearing 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.

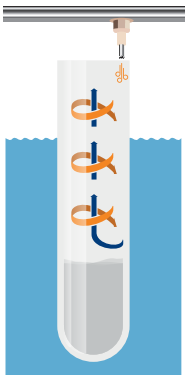


Figure 10. Gas vortex shearing action.

Ventilation

Solvent vapors are removed by an exhaust fan and routed to the exhaust port at the rear of the system. While a laboratory fume hood is an ideal location for installation of the system, any location is acceptable if the system is adequately vented through a proper ventilation system. For more information, see the TurboVap® Installation and Safety document.

Sleep Mode and Automatic Wake-Up

The system can be put in sleep mode manually, by scheduling a sleep time, and/or by having the lid sleep option turned on (see Figure 13 on page 6). With lid sleep enabled, the system will enter sleep mode when the lid is left open for more than 90 minutes.

When entering sleep mode, the system turns off the heater and the water bath light (if on), and activates the screen saver. When the water bath temperature drops below 35°C, the exhaust fan speed is lowered.

The sleep mode feature will not interrupt an ongoing run. If the system is used at the scheduled sleep time, the system will wait 30 minutes after the last user interaction before entering sleep mode.

The system will wake up either at a scheduled wake-up time or when a user deactivates the sleep mode. The system turns on the heater and the water bath light (if enabled) and starts heating the water bath to the set starting bath temperature (when started at scheduled wake-up time) or the last used water bath temperature (when started manually).

Audible Alarm and Lighting

To provide better visibility for the user, there is a light strip located inside the water bath. The light can be turned on or off in the software.

When the specified evaporation time is reached or the end-point level (+ any additional time) is reached for all tubes, the system turns off the gas flow, changes the color of the light strip to green (see Figure 11), and sounds an alarm. The alarm continues to beep every 30 seconds until the Evaporation Finished dialog is closed or the lid is opened.

An audible alarm will also sound (but only once) when the target bath temperature is reached, the end-point level (+ any additional time) is reached for a single tube, or an error occurs. The alarm volume can be set to Low, Medium, High, or OFF.

Figure 11. When a run is completed, the light in the water bath changes to green.

Determine Optimal Evaporation Conditions

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

Determine the settings that will best concentrate your samples by performing a test run using a tube with the approximate amount of solvent you want to evaporate. Start with the gas flow set to the lowest setting and then slowly increase the gas flow until a swirling action without splashing is observed inside the tube. If you will be using any of the evaporation modes that require a time setting, check the elapsed time in the software's status field when the sample has been evaporated to dryness or to the desired liquid level.

Determine the Appropriate Water Bath Temperature

The water bath eliminates hot spots and improves sample recovery for more volatile compounds, and the system's high evaporation rates eliminate the need for a high temperature water bath.

The system is not designed to cool, but the water bath temperature can be decreased from ambient by as much as 15°C by using the evaporation as a cooling source. Cooling ability varies with the evaporation rate.

Consider the following when selecting the water bath temperature:

- Higher water bath temperature speeds up the evaporation and can increase recoveries. However, highly volatile samples can be lost if allowed to sit for extended periods of time in a warm water bath.
- Boiling the solvent may incorrectly trigger the end-point sensors and can risk loss of sample. Select a water bath temperature below the boiling point of your solvent.
- Racks with end-point sensors can only be used at bath temperatures up to 60°C.

Determine the Appropriate Gas Flow

Consider the following when selecting the operating gas flow:

- Higher gas flow causes faster evaporation rates.
- Excessively high gas flow can cause loss of sample and cross-contamination due to splashing.
- For the best results, always use the highest gas flow possible without causing splashing.
- As the sample volume decreases during a concentration, increase the gas flow manually or by using a gradient (see method mode on the next page). This will reduce the overall evaporation time.
- Plugged nozzles will increase the gas flow. This is not reflected by the software. The gas flow displayed in the software is always the flow per nozzle without any nozzles plugged.

  Note: To get the correct gas flow for the installed manifold, the correct manifold setup must be selected in the software's settings view (see page 6).

Convert Pressure to Gas Flow

If you want to use a method from a previous system model, the table below shows how to convert the pressure on the old system to the gas flow on the new system. We recommend that these gas flow values are only considered as guidelines and that the gas flow is re-optimized for the new system according to the bullet list above.

Pressure		Gas Flow	
psi	bar	LV (L/min)	II (L/min)
2	0.1	0.7	1.3
5	0.3	1.2	1.8
7	0.5	1.5	2.2
10	0.7	1.8	2.8
12	0.8	2.0	3.2
14	1.0	2.2	3.5
16	1.1	2.5	3.8
18	1.2	2.7	4.2
20	1.4	2.9	4.5

Table 1. The pressure set on an old system converted to the gas flow on the new system.

Determine the Appropriate Evaporation Mode

There are five evaporation modes available (see Figure 12):

- **Manual:** Evaporate until the user presses the **Stop** button.
- **Time:** Evaporate for a set period of time.
- **End-Point:** Evaporate until the end-point sensors detect a liquid level of 0.2 or 0.7 mL depending on the glassware. Each sample tube is controlled individually.
- **End-Point + Time:** Evaporate for a set period of time *after* the sensor detects a liquid level of 0.2 or 0.7 mL depending on the glassware. Each sample tube is controlled individually.
- **Method**: There are several options:
  - Evaporate using a step or ramp gradient of gas flow and time settings with a maximum of three segments.
  - Evaporate using end-point detection; see End-Point and End-Point + Time above.
  - Evaporate using a combination of a gradient and end-point detection.
  - Evaporate for a set period of time.

Notes

- The rack with end-point sensors cannot be used if:
  - The water bath temperature is above 60°C.
  - Sample coats the glass or darkens too rapidly.
  - The desired end-point volume is greater than 0.2 or 0.7 mL.
- The two end-point detection modes are only enabled when a TurboVap II end-point rack has been connected to the system's **AUX** port.

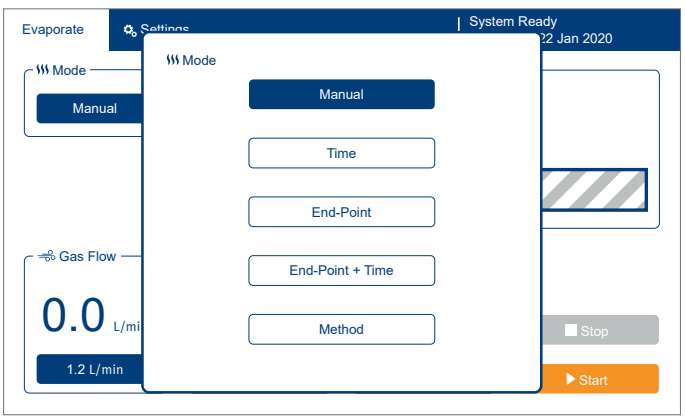


Figure 12. The different evaporation modes that can be selected in the software.

Define System Settings

Enter the software's settings view (see Figure 13) by pressing **Settings** in the menu bar.

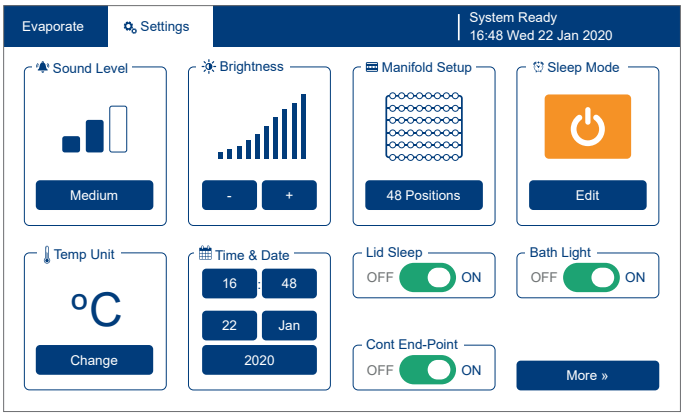


Figure 13. The Settings view.

The following system settings are available:

- **Sound Level:** The system will sound when the target bath temperature is reached, the end-point level (+ any additional time) is reached for a single tube, a run is completed, or an error occurs. The sound level can be set to Low, Medium, High, or OFF.
- **Brightness:** The brightness of the touch screen.
- **Manifold Setup:** The installed manifold and the rack(s) to be used. The following options are available:
  - **48 positions:** The TurboVap LV manifold with the 48 position multi rack.
  - **24 positions:** The TurboVap LV manifold with the 24 position multi rack. Half of the nozzles must be plugged as shown in Figure 2 on page 1.
  - **6 positions:** The TurboVap II manifold with 6 position rack with or without end-point sensors.
  - **Extrahera 1 x 24:** The TurboVap EH manifold with one Extrahera sample/collection rack.
  - **Extrahera 2 x 24:** The TurboVap EH manifold with two Extrahera sample/collection racks.
  - **PRESSURE+ 48:** The TurboVap P+ manifold with one TurboVap P+ rack.

  For instructions on how to change the installed manifold, see page 8.
- **Sleep Mode:** See “Sleep Mode and Automatic Wake-Up” below.
- **Temp Unit:** The temperature unit in use by the system, degrees Celsius or Fahrenheit. Toggle by pressing **Change**.
- **Date:** The current date.
- **Time:** The current time (24 hour time).
- **Lid Sleep**: See “Sleep Mode and Automatic Wake-Up” below.
- **Cont End-Point:** Continuous end-point evaporation turned ON allows for replacing a finished tube and restarting end-point detection for that rack position without restarting the run. If turned OFF, it is not possible to add tubes during the run. For more information, see “Start a New Evaporation in Continuous End-Point Mode” on page 11.
- **Bath Light:** The bath light can be turned ON or OFF.

By pressing the **More** button in the settings view, the following information and features will be available: 1) software versions, instrument serial number, and end-point board serial number (if connected), 2) trademarks and copyright information, 3) button for factory reset, 4) button for accessing the calibration of the water bath temperature, and 5) buttons for accessing wizards for verifying and calibrating the touch screen.

Sleep Mode and Automatic Wake-Up

The system can be put in sleep mode manually by pressing the orange button in the settings view (see Figure 13), automatically by scheduling a sleep time in the sleep mode view (see Figure 14), and/or by having the lid sleep option turned on (see Figure 13). With lid sleep enabled, the system will enter sleep mode when the lid is left open for more than 90 minutes.

When entering sleep mode, the system turns off the heater and the water bath light (if on), and activates the screen saver. When the water bath temperature drops below 35°C, the exhaust fan speed is lowered).

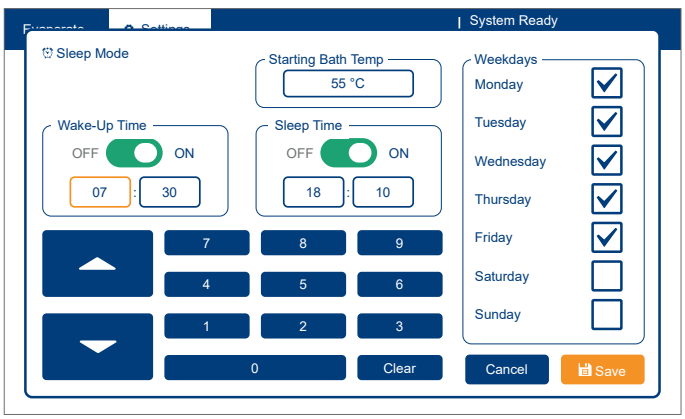


Figure 14. The Sleep Mode view.

The sleep mode feature will not interrupt an ongoing run. If the system is used at the scheduled sleep time, the system will wait 30 minutes after the last user interaction before entering sleep mode.

The system will wake up either at a scheduled wake-up time or when a user deactivates the screen saver (by touching the screen) and then presses **Wake Up**. The system turns on the heater and the water bath light (if enabled) and starts heating the water bath to the set starting bath temperature (when started at scheduled wake-up time) or the last used water bath temperature (when started manually).

Sleep Mode and Automatic Wake-Up Parameters

The following parameters are available in the sleep mode view (see Figure 14):

- **Starting Bath Temp:** The target water bath temperature when starting up from sleep mode at the scheduled wake-up time.
- **Wake-Up Time:** The time when the system will turn on the heater and the water bath light (if enabled) and start heating the water bath to the set starting bath temperature. The system will start in manual mode.
- **Sleep Time:** The time when the system will turn off the heater and the water bath light (if on), and activate the screen saver.
- **Weekdays:** The weekdays that the sleep mode settings will be used.

Calibrate the Water Bath Temperature

The water bath temperature can be adjusted after calibrating at two temperatures that encompass (above and below) the range of temperatures used in your applications.

1. Set the evaporation mode to **Manual** or **Time**.
2. Set the first water bath temperature by pressing the button in the **Bath Temp** field.
3. Lower a temperature probe into the water bath and close the lid.
4. Allow the water bath temperature to stabilize and then take note of the measured temperature.
5. Repeat steps 2 through 4 with the second water bath temperature. Note that the difference between the first and second temperature must be greater than 10°C.
6. When you are done, press **More** in the settings view and then **Calibrate Temp**.
7. Enter the values of set and measured temperatures into the **Temp 1** and **Temp 2** fields; see Figure 15.
8. Press **Calculate** to calculate new temperature coefficients to be used by the system.
9. Press **Save**.
10. Verify the calibration by repeating steps 2 through 5.

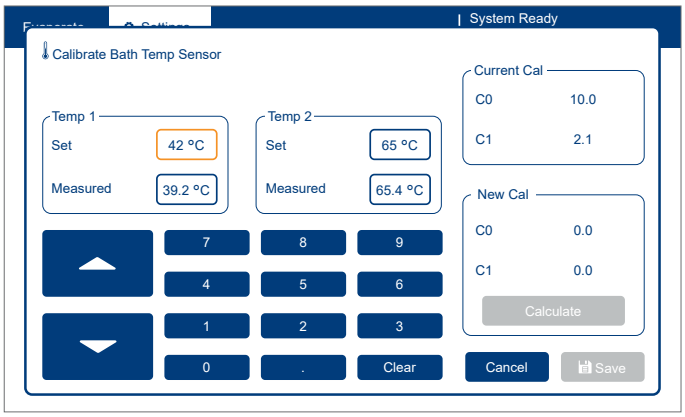


Figure 15. The Calibrate Temperature view.

Prepare the System

Change the Manifold

Warning

» The nozzles have sharp edges and may have come into contact with harmful sample residues. Avoid contact.

There are four different manifolds available for the system. The manifold is selected based on the rack you want to use. For more information, see “Manifolds” on page 1.

1. With the lid closed, remove the four screws on the top of the lid (see Figure 16A).
2. Open the lid and remove the cover for the gas connections on the manifold.

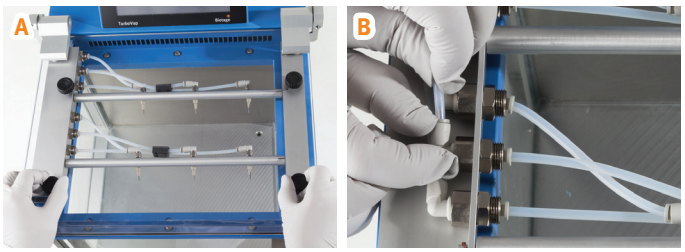


Figure 16. A: The four screws on the top of the lid holds the manifold in position. B: The gas connections on the manifold.

3. Disconnect the gas tubes from the manifold. A tube is released by pushing the tube in, pushing the release collar into the fitting, and then pulling the tube out. See Figure 16B.
4. Clean the manifold using a non-alkaline detergent and let it dry. Store the manifold in a clean and dust free environment.
5. Connect the gas tubes to the desired manifold. The gas tubes and nozzle rows or nozzles are numbered from 1 to 6.

   Note: The TurboVap P+ manifold only uses four gas tubes. Fasten the unused tubes (1-2) using the manifold's tube clip.
6. Place the cover over the gas connections.
7. Close the lid.
8. Fasten the manifold to the lid using the four screws.

Adjust the Water Level

Warning

» Always ensure that the drain tube is inserted into a waste container of a suitable size before connecting the drain tube to the system’s drain port.

» The temperature of the water bath and the drain connector can be up to 90°C. Avoid contact.

The water level must be adjusted for the selected rack and sample tube type. To avoid flooding the water bath, we recommend the following procedure.

1. If a rack is present in the water bath, carefully lift it out of the bath, clean it using a non-alkaline detergent, and let it dry.
2. Lower the water level to the minimum level marked on the water bath:
   a. To avoid the risk of burning yourself with the water or on the drain connector, lower the water bath temperature to below 55°C.
   b. When the water bath temperature is below 55°C, insert the drain tube supplied with the system into a waste container that can take at least 12 liters.
   c. Push in the drain tube connector into the **DRAIN** port on the front right corner of the system; see Figure 17A.
   d. When the water level is at the minimum level marked on the water bath (see Figure 17B), disconnect the drain tube by pressing on the top of the **DRAIN** port (see Figure 18A).
   e. Empty the waste container.
3. Gently lower the desired rack, with empty tubes in all positions except one, into the water bath.
4. Place a funnel (not supplied) in the empty rack position and add deionized water until the water’s surface is as high as the initial liquid level will be in the tubes but not higher than just below the blue water bath top cover; see Figure 18B.

Figure 17. A: Insert the drain tube into a waste container before pushing in the drain tube connector into the DRAIN port. B: The minimum level on the water bath.

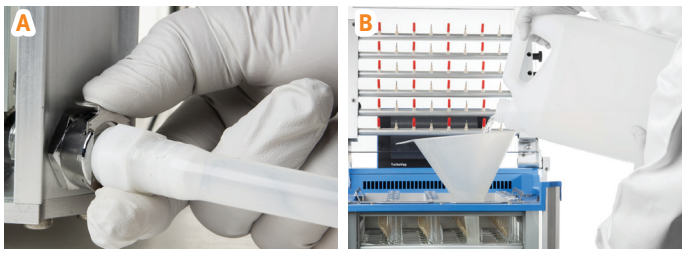


Figure 18. A: Disconnecting the drain tube by pressing on the top of the DRAIN port. B: Add deionized water until the water’s surface is as high as the initial liquid level will be in the tubes but not higher than just below the blue water bath top cover.

Adjust the Nozzles

Warning

» The nozzles have sharp edges and may have come into contact with harmful sample residues. Avoid contact.

Note: The nozzles on the TurboVap II manifold have fixed positions and cannot be adjusted.

Note: Incorrectly adjusted nozzles will not generate a vortex shearing action and result in poor evaporation speeds, and may also result in broken tubes and samples leaking into the water bath.

The nozzles must be adjusted for the selected rack and tube type. To avoid broken tubes, we recommend the following procedure.

1. Ensure that the water level is correct; see instructions above.
2. If using the TurboVap LV multi rack with 24 positions or the TurboVap EH sample/collection rack holder with only one rack, plug the nozzles that are not in use. See Figure 2 on page 1 on how to plug the TurboVap LV manifold.
3. Ensure that the desired rack is available in the water bath with one empty tube of the correct type.
4. Adjust the nozzle row with the empty tube so that the nozzles are as far to the left as possible.
5. Close the lid and adjust the nozzle row with the empty tube so that the nozzles are as far to the right as possible without the nozzle touching the side of the tube.
6. Open the lid and adjust the other nozzle rows into the same position using the engraved adjustment lines on the manifold; see Figure 19.

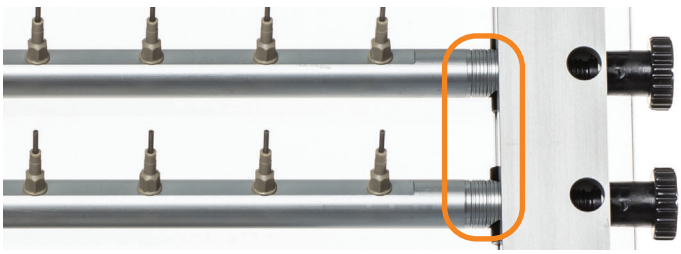


Figure 19. The engraved adjustment lines on the manifold.

Set the Water Bath Temperature

Warning

» The temperature of the water bath and the drain connector can be up to 90°C. Avoid contact.

» Do not operate the system without water in the water bath.

1. If applicable, close the lid and turn on the system. The mains switch is located on the right side of the system.

   Note: The system should always be on whenever it contains samples so that the fan can evacuate solvent vapors.

2. Set the water bath temperature by pressing the button in the **Bath Temp** field. For more information, see “Determine the Appropriate Water Bath Temperature” on page 4. Note that this button is not enabled in method mode; see page 13.

   Note: The temperature can be set to up to 99°C. The actual bath temperature is limited to 90°C for safety reasons.

3. When the target water bath temperature has been reached, the user will be notified by a dialog on the touch screen (see Figure 21) and an audible alarm.

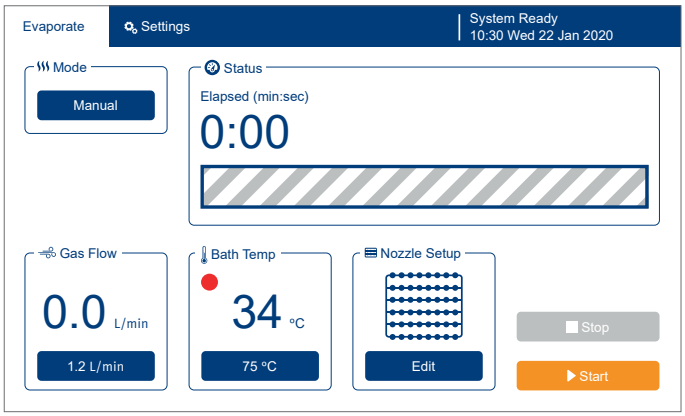


Figure 20. When the heater is on, a red, blinking dot is displayed in front of the current water bath temperature.

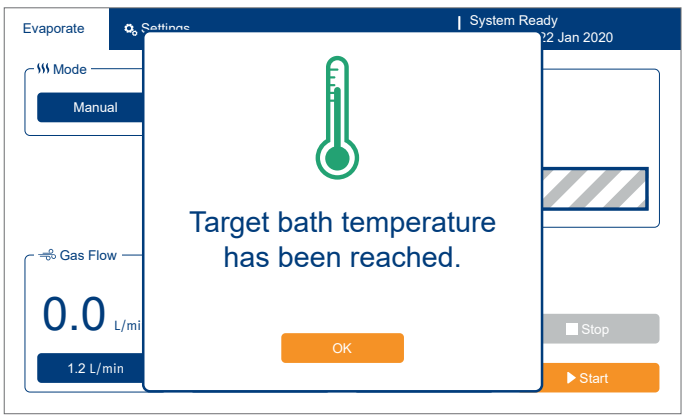


Figure 21. The system alerts the user when the target bath temperature has been reached.

Evaporate

Note: If the system is not used for an extended period of time, we recommend that it is put in sleep mode. See “Sleep Mode and Automatic Wake-Up” on page 6.

Note: To prevent condensation within the system, the lid should always be left open when the system is turned off and the water bath contains water.

Set Up and Start an Evaporation Run

1. Prepare the system as described on page 8 to page 9.
2. Check that the incoming gas supply is turned on and has sufficient reserve for the run.
3. If using a rack with end-point sensors, gently lower the rack (empty) into the water bath and connect the sensor connection box to the **AUX** port on the right side of the system.
4. Select **Evaporate** from the menu bar.
5. Set up the evaporation parameters; see “Evaporation Parameters” below.
6. When the target water bath temperature has been reached (see Figure 21 on page 9), either load the sample tubes into the rack when positioned inside the water bath or gently lower the rack with the sample tubes into the water bath. The latter is not possible if using a rack with end-point sensors.
7. Close the lid and press **Start**.

Evaporation Parameters

The following evaporation parameters are available:

- **Mode:** The selected evaporation mode; see “Determine the Appropriate Evaporation Mode” on page 5.

  Note: The two end-point detection modes are only enabled when a TurboVap II end-point rack has been connected to the **AUX** port. After connection, it will take a few seconds before the two modes are enabled.

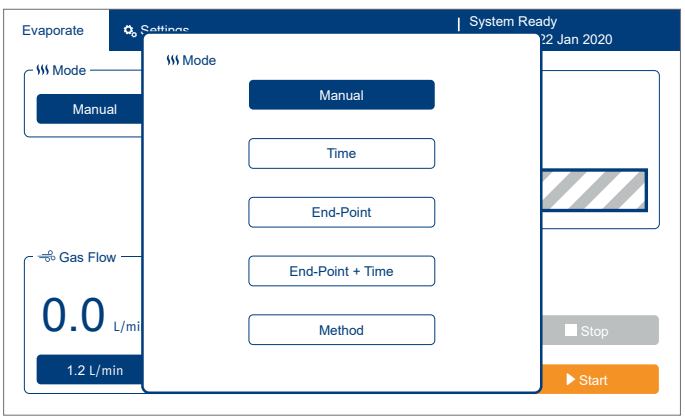


Figure 22. The different evaporation modes that can be selected.

- **Method:** The selected evaporation method. Only available in method mode. To modify a method, see page 13.
- **Time:** The evaporation time (when in time mode) or the amount of time the evaporation continues in a sample tube after its liquid level passes below the sensor (when in the end-point + time mode).
- **Gas Flow:** The internal gas flow directed at each of the sample tubes. For more information, see “Determine the Appropriate Gas Flow” on page 4. To change for a method, see page 13.
- **Bath Temp:** The target water bath temperature. For more information, see “Determine the Appropriate Water Bath Temperature” on page 4. To change for a method, see page 13.
- **Nozzle Setup:** Defines whether a nozzle row (when using racks with 24 or 48 positions) or a nozzle (when using racks with 6 positions) is enabled (ON) or not (OFF). Ensure that the nozzles for all positions that will contain sample tubes are enabled.

  Note: If not using all rack positions in an activated nozzle row, single nozzles can be plugged. Note that the gas flow displayed in the software is always the gas flow per nozzle without any nozzles plugged. To get the correct gas flow for the installed manifold, the correct manifold setup must be selected in the software’s settings view (see page 6).

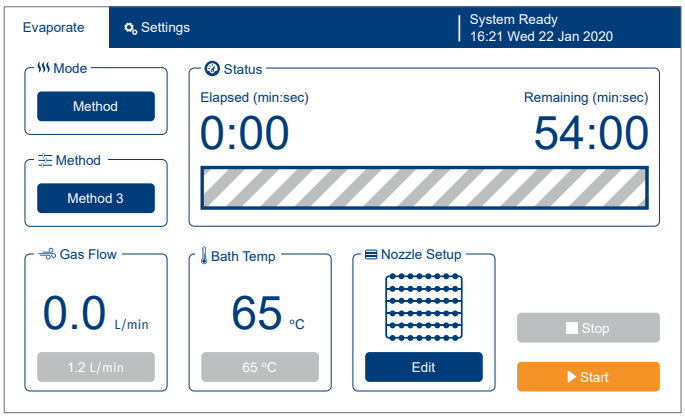


Figure 23. The Evaporate view when method mode is selected.

Monitor an Evaporation Run

During the evaporation run, the current and set values for the water bath temperature, gas flow, and time can be monitored on the touch screen; see Figure 24. If the difference between the actual and the set water bath temperature is more than ±2°C, the user will be notified by a dialog on the touch screen and an audible alarm. If using end-point sensors, it is also possible to see when a specific end-point sensor is triggered and when the tube is completed.

If running in method mode, the evaporation parameters for the selected method can be displayed by pressing the button in the **Method** field.

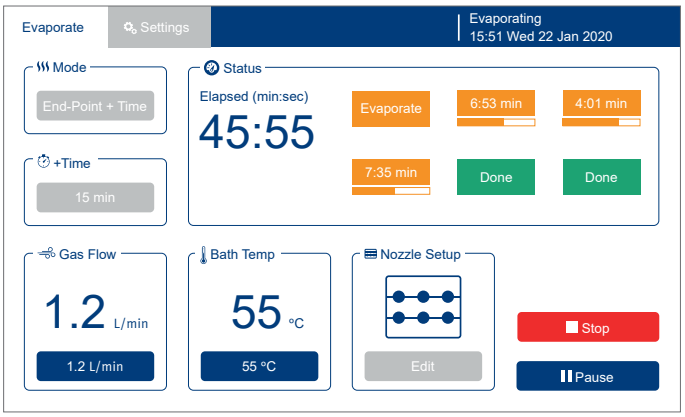


Figure 24. The Evaporate view when end-point + time mode is selected.

Edit an Evaporation Run in Progress

During the run, it is in most cases possible to change the gas flow and the water bath temperature, and enable or disable nozzle rows or nozzles. When running in method mode, it is not possible to change the gas flow or bath temperature, and when using a rack with end-point sensors it is not possible to enable or disable nozzles.

Start a New Evaporation in Continuous End-Point Mode

If continuous end-point evaporation has been activated (see page 6), it is possible to replace a finished tube with a new one during the run. When a tube is finished (the rack position is green with the label **Done** in the Evaporate view as shown in Figure 25 and the audible alarm sounds once), open the lid and replace the tube. As the lid is closed again, the **Continuous End-Point Mode** dialog opens showing an overview of the tubes with the option to restart the finished position; see Figure 26. Select **YES** and press **OK** to resume the run with the new tube added.

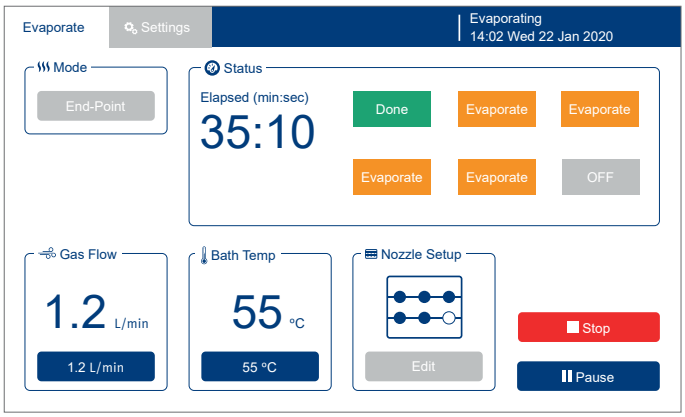


Figure 25. The Evaporate view showing one tube that has reached the end-point level.

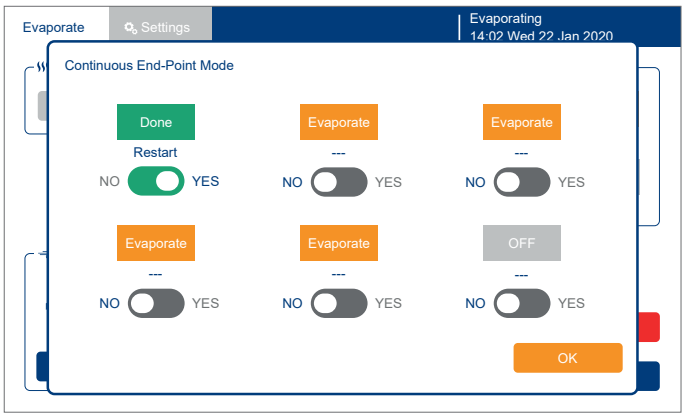


Figure 26. The Continuous End-Point Mode dialog showing one rack position that can be restarted.

End of an Evaporation Run

If the evaporation run is not ended automatically (when manual mode is selected), end the run by pressing **Stop**.

When the specified evaporation time is reached or the end-point level (+ any additional time) is reached for all tubes, the system turns off the gas flow, changes the light inside the water bath to green (see Figure 11 on page 3), and sounds an alarm. The alarm continues to beep every 30 seconds until the **Evaporation Finished** dialog (see Figure 27) is closed or the lid is opened.

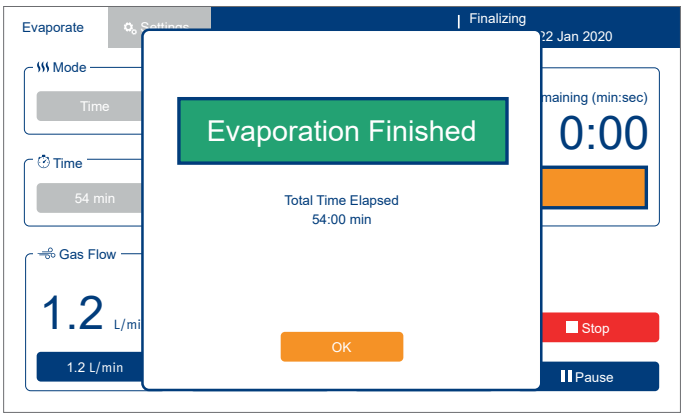


Figure 27. The Evaporation Finished dialog is displayed when the specified evaporation time is reached or the end-point level (+ any additional time) is reached for all tubes.

An audible alarm will also sound (but only once) each time the end-point level (+ any additional time) is reached for a single tube.

Note: The alarm and water bath light can be turned off in the settings view; see page 6.

Pause or Abort an Evaporation Run

To pause the run, either press **Pause** or lift the lid. The gas flow is turned off and the timer is paused. The evaporation can be resumed by pressing **Resume** or, if the pause was triggered by the lid being opened, by closing the lid.

To abort the run before the specified evaporation time has been reached or the end-point level has been reached for all tubes, press **Stop**.

To turn off the gas flow for a single nozzle row or nozzle, disable it by pressing the **Edit** button in the **Nozzle Setup** field. Note that this is not possible when using a rack with end-point sensors.

Unload the Samples

Open the lid and remove the sample tube(s) or carefully lift the whole rack out of the water bath.

If using end-point sensors, reconstitute to the desired volume (0.5 or 1.0 mL) and, if necessary, use this volume to rinse the angled part of the tube and end-point stem several times to remove any sample residues on the tube wall.

Note: Prompt removal of sample tubes is important since highly volatile compounds can be lost if allowed to sit for an extended period of time.

Figure 28. A rack left shortly above the water bath to drain.

Define Methods

It is possible to save up to ten different evaporation methods. The methods can be set up to:

- Evaporate using a step or ramp gradient of gas flow and time settings with a maximum of three segments.
- Evaporate using end-point detection; see the End-Point and End-Point + Time modes on page 5.
- Evaporate using a combination of a gradient and end-point detection.
- Evaporate for a set period of time.

Edit or Rename a Method

If you want to edit or rename a method before your run it, proceed as follows:

1. Select **Evaporate** from the menu bar.
2. Press the button in the **Mode** field and select **Method** in the appearing dialog.
3. Press the button in the **Method** field. The **Method** dialog opens; see Figure 29.
4. Select the method you want to modify and then press **Edit** or **Rename**.
5. In the appearing dialog, edit the desired evaporation parameters (see"Evaporation Parameters" below) or enter the desired name.
6. When done, press **Save**.
7. In the method view, press **OK** to return to the Evaporate view.

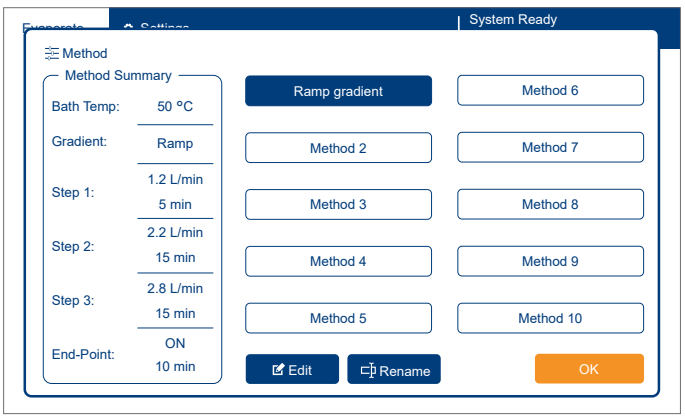


Figure 29. The Method view where you select the method you want to run, or modify a method and then run it.

Evaporation Parameters

The following evaporation parameters are available in the edit method view (see Figure 30):

- **Gradient Type:** A step or ramp gradient with up to three segments with different gas flows and lengths (time). If you only want to evaporate for a set period of time or using end-point detection, turn OFF the gradient feature.
- **Step 1–3:** Each gradient segment consists of a setting for the gas flow directed at each of the sample tubes and the duration time. If the gradient is turned OFF, enter the gas flow and, if not using end-point detection, the evaporation time in the Step 1 field. For more information, see "Determine the Appropriate Gas Flow" on page 4.
- **End-Point Detection:** If this option is enabled, the evaporation is ended in a rack position when the end-point sensor detects a liquid level of 0.2 or 0.7 mL depending on the tube's stem size. If a time is also entered, the evaporation continues for the amount of time that is specified after the liquid level is detected. The end-point detection option can be used in combination with a gradient.
- **Bath Temp:** The target water bath temperature. For more information, see "Determine the Appropriate Water Bath Temperature" on page 4.

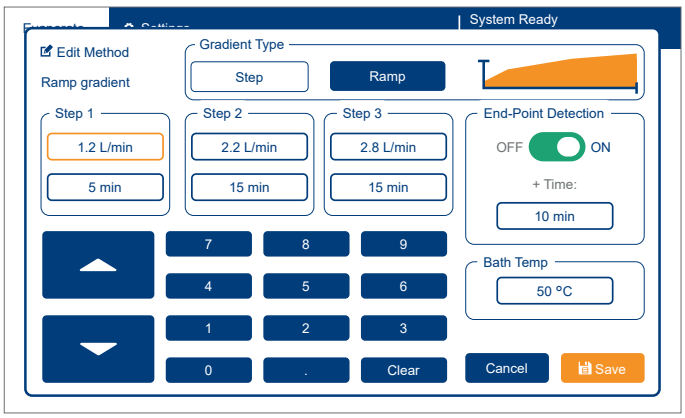


Figure 30. The Edit Method view.

Maintenance

Warning

- Always turn off the system, unplug the power cord, and let the water bath cool down before performing maintenance.
- There are no user serviceable parts inside the system. Covers and safety shields may only be removed by an authorized Biotage service engineer. Potential electrical hazard exists due to high voltage circuits inside the system.
- The power cord should be inspected periodically and replaced if damaged or altered. Use only a power cord supplied by Biotage.
- Handle chemical and liquid waste according to the Safety Data Sheets and to local/national guidelines on laboratory safety procedures.

Clean the Exterior of the System

Clean the exterior of the system as often as required. If the touch screen has been contaminated by chemicals, it must be cleaned immediately.

1. Turn off the system and disconnect the power cord.
2. Clean the touch screen and the exterior of the system with a soft and clean cloth. The cloth can be lightly dampened with isopropanol or ethanol.

Clean the Racks and Manifolds

Warning

- The nozzles have sharp edges and may have come into contact with harmful sample residues. Avoid contact.

The racks and manifolds must be cleaned after spillage or before storage. Clean using a non-alkaline detergent. Store in a clean and dust free environment.

Clean the Water Bath

Warning

- If (glass) debris, sample, or solvent enters the water bath, immediately remove the rack, empty the water bath, and clean both the rack and the water bath.

Clean the water bath as often as required but at least once a week.

1. To avoid the risk of burning yourself on the water or the drain connector, lower the water bath temperature to below 55°C.
2. If a rack is present in the water bath, carefully lift it out of the bath, clean it using a non-alkaline detergent, and let it dry.
3. When the water bath temperature is below 55°C, turn off the system and disconnect the power cord.
4. Remove any (glass) debris from the water bath.
5. Empty the water bath:
   a. Insert the drain tube supplied with the system into a waste container that can take at least 12 liters.
   b. Push in the drain tube connector into the **DRAIN** port on the front right corner of the system; see Figure 31A.
   c. When the water bath is empty, disconnect the drain tube by pressing on the top of the **DRAIN** port (see Figure 31B).
   d. Empty the waste container.

Figure 31. Connecting (A) and disconnecting (B) the drain tube.

6. Clean the bath walls with an appropriate cleaning solution and then rinse.
7. Empty the water bath; see step 5.
8. Pour 4.5 liters of **deionized** water into the water bath; see Figure 32A. The water level should now be at the minimum level marked on the water bath.
9. Gently lower the desired rack, with empty tubes in all positions except one, into the water bath.
10. Place a funnel (not supplied) in the empty rack position and add deionized water until the water's surface is as high as the initial liquid level will be in the tubes but not higher than just below the blue water bath top cover; see Figure 32B.

Figure 32. The water's surface must be above the minimum level marked on the water bath but not higher than just below the blue water bath top cover.

Replace a Multi Rack Height Adjustment Handle

A multi rack height adjustment handle only has to be replaced when broken.

1. Remove the two screws holding the broken handle using a T8 Torx or a Philips #1 screwdriver.
2. Slide the handle down to the bottom of the rack and remove it.
3. Fasten a new height adjustment handle (P/N 415232SP) to the height adjustment bar; see Figure 33. Note that this part comes in pairs; one left and one right handle.

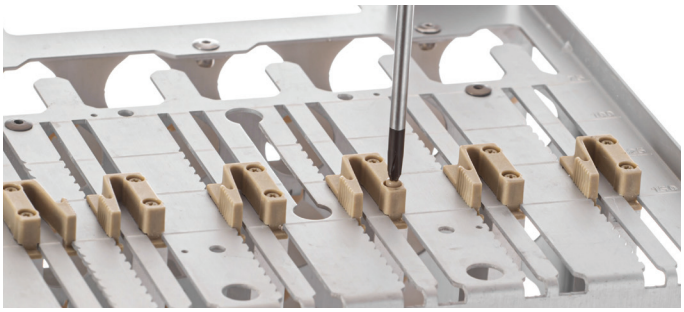


Figure 33. Replacing a height adjustment handle.

Replace a Multi Rack Vial Spring

A multi rack vial spring only has to be replaced when broken.

1. Release the vial spring by squeezing it together at the top below the rack's top plate; see Figure 34.
2. Remove the vial spring by lifting it straight up.
3. Insert a new vial spring (P/N 415231SP).

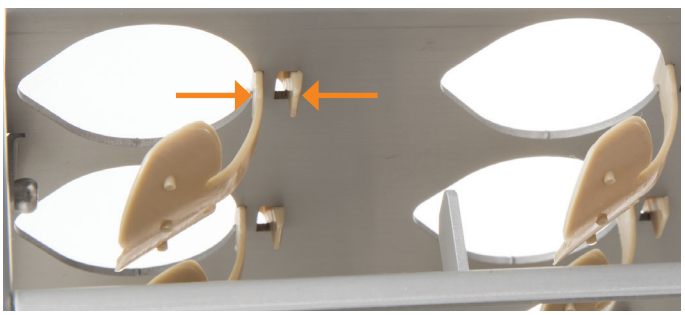


Figure 34. Releasing a vial spring.

Replace a Nozzle

Warning

» The nozzles have sharp edges and may have come into contact with harmful sample residues. Avoid contact.

A nozzle only has to be replaced when broken or clogged. Replace the nozzle (P/N 414892SP for standard manifolds and 416164SP for PTFE coated manifolds) and finger tighten, and then tighten 1/6 turn using a 5 mm hexagon socket wrench.

Replace an End-Point Sensor

If the software reports a calibration error, there might be air bubbles around the sensor optics. Dislodge the air bubbles by moving the tube up and down a couple of times. If this does not solve the problem, replace the end-point sensor as described below.

1. Remove the broken end-point sensor by sliding it to the middle position and then to the side; see Figure 35.

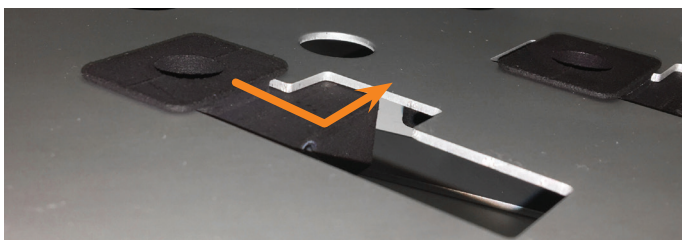


Figure 35. Removing a broken end-point sensor.

2. Unsnap the sensor cable from the five or six clips holding it in position.
3. Disconnect the sensor cable from the sensor connection box.
4. Install a new end-point sensor (P/N 415229SP). See Figure 36 on how to route the cable.

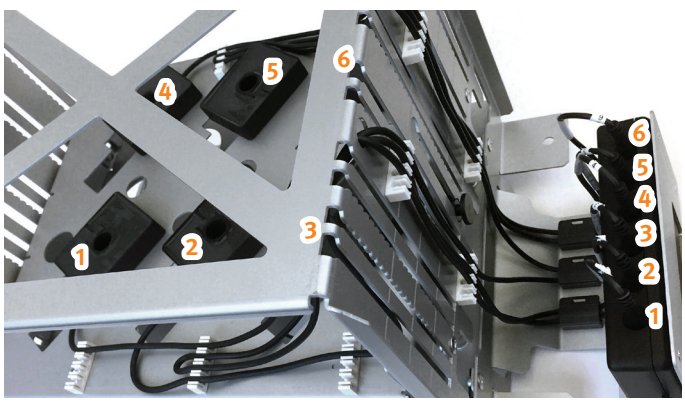


Figure 36. The wiring of the end-point sensors.

Replace the Fuse

Warning

» Use only exact replacement fuses supplied by Biotage. Incorrect fuses create a potential fire hazard and personal injury.

1. Turn off the system and disconnect the power cord.
2. Using a flat-bladed screwdriver, push and turn the slotted center of the fuse holder counterclockwise until the holder pops out; see Figure 37.
3. Clean the new fuse (P/N 415578SP) using a cloth lightly dampened with ethanol and wipe it dry with a dry cloth.

   Note: Do not touch the metal surfaces after the fuse has been cleaned.
4. Replace the old fuse.
5. Put the fuse holder back in place by pushing it in and turning it clockwise until it locks.

If the fuse blows shortly after replacing it, please contact Biotage® 1-Point Support™.

Figure 37. Removing the fuse holder.

Long Term Storage

Warning

» The nozzles have sharp edges and may have come into contact with harmful sample residues. Avoid contact.

1. Turn off the system and disconnect the power cord.
2. Turn off the gas supply.
3. If a rack is present in the water bath, carefully lift it out of the bath, clean it using a non-alkaline detergent, and let it dry.
4. Empty and clean the water bath as described in steps 5 through 7 in “Clean the Water Bath” on page 14, and allow it to dry.
5. Clean the exterior of the system as described on page 14.
6. If necessary, clean the manifold using a non-alkaline detergent.
7. Store the system in a dust free environment with the lid closed.

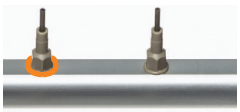
Troubleshooting

End-Point

- If the end-point modes are disabled in the software, ensure that an end-point rack has been connected to the system's **AUX** port.
- If the software reports a calibration error, there might be air bubbles around the sensor optics. Dislodge the air bubbles by moving the tube up and down a couple of times. If this does not solve the problem, replace the end-point sensor as described on page 15.

Evaporation

- If the evaporation is uneven between tubes, one or more nozzles may be leaking and need to be tightened or replaced. A nozzle should be finger tightened and then tightened 1/6 turn using a 5 mm hexagon socket wrench. Check for leakage by applying water around the suspected area (see image below) and starting a run with the lid open (press **Override** in the open lid warning dialog).



- If the evaporation rate is too slow:
  - Ensure that the nozzles are adjusted properly; see “Adjust the Nozzles” on page 9.
  - Ensure that the water level is not too low; see “Adjust the Water Level” on page 8.
  - Ensure that the water bath temperature is not too low; see “Determine the Appropriate Water Bath Temperature” on page 4.
  - Ensure that the gas flow is not too low; see “Determine the Appropriate Gas Flow” on page 4.
- If the evaporation rate is too fast or splashing occurs:
  - Ensure that the water bath temperature is not too high and causing the solvent to boil; see “Determine the Appropriate Water Bath Temperature” on page 4.
  - Ensure that the gas flow is not too high; see “Determine the Appropriate Gas Flow” on page 4.
- If there is no gas flow:
  - Ensure that the gas supply is turned on and that there is enough gas available for the run.
  - Ensure that the gas inlet tube is not obstructed.
- If there is no evaporation in a row of tubes, ensure that the nozzles for all rack positions that contain sample tubes are enabled in the software.
- If there is no or slow evaporation in a single tube:
  - When using a system with TurboVap II configuration, ensure that the nozzles for all rack positions that contain sample tubes are enabled in the software.
  - The nozzle may be blocked. Replace it; see page 15.
- If the water bath temperature and gas flow settings are disabled in the Evaporate view, the evaporation mode is set to **Method**. To change the temperature and/or gas flow settings for a method, see “Define Methods” on page 13. Note that it is not possible to change these settings when running a method.
- If the recovery of sample is low:
  - Ensure that the water bath temperature is not too high and causing the solvent to boil; see “Determine the Appropriate Water Bath Temperature” on page 4.
  - Ensure that the sample is not left too long in the water bath after the evaporation is completed.
  - Ensure that the gas flow is not too high and causing splashing; see “Determine the Appropriate Gas Flow” on page 4.
  - When using a system with TurboVap II configuration, check if there is sample residues on the tube wall. Reconstitute to the desired volume, 0.5 or 1.0 mL, and use this volume to rinse the angled part of the tube and end-point stem several times.

Gas Supply

- If there is a leakage at the gas inlet (the **N_2** port):
  - Ensure that the gas inlet tube is securely attached.
  - Ensure that a gas inlet tube with the correct outer diameter is used, i.e. 6 mm. Always use tubing and adapters supplied by Biotage.

Sleep Mode and Automatic Wake-Up

- If the system turns on and/or off by itself, the sleep mode and/or lid sleep option is/are enabled. To disable or change the sleep settings, see page 6.

Touch Screen

- If the touch screen is not responding as expected, test its calibration:
  - Press **More** in the settings view and then **Verify Screen**.
  - Draw or write something on the touch screen to verify its function and calibration.
- If the touch screen calibration is off, calibrate it:
  - Press **More** in the settings view and then **Calibrate Screen**.
  - Follow the instructions on the screen and then test the calibration as described in the bullet above.
- If you cannot access the touch screen calibration wizard due to a faulty calibration, restart the system and repeatedly open and close the lid during start-up. This will open the calibration wizard.

  Note that the lid only needs to be opened approximately 50 mm.

Water Bath

- If the water is turbid, clean the water bath and add water treatment according to the supplier's recommendations. See “Clean the Water Bath” on page 14.
- If the heating of the water bath is too slow, ensure that the voltage selector switch (located on the right side of the system) is in the correct position.

General Information

Accessories and Spare Parts

Only genuine Biotage accessories must be used in the system. To order consumables and accessories, see contact information on the back of this document or visit our website www.biotage.com.

Manifolds and Racks

Part No.	Description	Qty
415408	TurboVap LV Manifold (48 Nozzles)	1
416129SP	TurboVap LV Manifold (48 Nozzles) - PTFE Coated	1
415489	TurboVap LV Multi Rack (48 Positions, 10–16 mm Mini Vials)	1
414964	TurboVap LV Multi Rack (48 Positions, 10–20 mm Tubes)	1
415129	TurboVap LV Multi Rack (24 Positions, 21–32 mm Tubes)	1
415222	TurboVap II Manifold (6 Nozzles)	1
415830SP	TurboVap II Manifold (6 Nozzles) - PTFE Coated	1
415535	TurboVap II Rack with End-Point Sensors (6 Positions, 50 mL Tubes)	1
415100	TurboVap II Rack with End-Point Sensors (6 Positions, 200 mL Tubes)	1
415494	TurboVap II Rack without End-Point Sensors (6 Positions, 50/200 mL Tubes)	1
415490	TurboVap EH Manifold (2 x 24 Nozzles)	1
415510	TurboVap EH Sample/Collection Rack Holder (2 Positions)	1
415491	Sample/Collection Rack (24 Positions, 12 x 75 mm Tubes)	1
415585	Sample/Collection Rack (24 Positions, 16 x 75 mm Tubes)	1
415492	Sample/Collection Rack (24 Positions, 18 x 75 mm Tubes)	1
415682SP	TurboVap P+ Manifold (48 Nozzles)	1
415675SP	TurboVap P+ Rack (48 Positions, 16 x 100 mm Tubes)	1
415690SP	TurboVap P+ Multi Rack (48 Positions, 12-13 mm Tubes)	1
414892SP	Replacement Nozzle for TurboVap	8
416164SP	Replacement Nozzle for TurboVap, Treated	8
C46811	Nozzle Plug for TurboVap	25
415231SP	Multi Rack Vial Spring	10
415232SP	Multi Rack Height Adjustment Handles (Pair)	2
415229SP	Replacement End-Point Sensor for TurboVap II	1

Tubes and Caps

Part No.	Description	Qty
C48985	10 x 75 mm Test Tube	1000
C44651	12 x 75 mm Test Tube	1000
C40707	13 x 100 mm Test Tube	1000
413282	16 x 75 mm Test Tube	1000
C40708	16 x 100 mm Test Tube	1000
C45273	16 x 125 mm Test Tube	1000
414574	18 x 75 mm Test Tube	304
C40709	20 x 150 mm Test Tube	500
C47811	10 mL Conical Centrifuge Test Tube	125
C44941	15 mL Conical Centrifuge Test Tube	125
C47816	15 mL Volumetric Test Tube for AutoTrace	12
C44942	Snap Caps for 15 mL Conical Centrifuge Test Tubes (Polypropylene)	500
417406	Cover plug 50 mL	6
417407	Cover plug 200 mL	6
C128506	Evaporation Tube TurboVap II, 200 mL, 1 mL End-Point	12
C128507	Evaporation Tube TurboVap II, 200 mL, 0.5 mL End-Point	12
C128508	Evaporation Tube TurboVap II, 50 mL, 0.5 mL End-Point	12
C128511	Evaporation Tube TurboVap II, 50 mL, 1 mL End-Point	12
C128512	Test Tube, 50 mL, Centrifuge	12

Misc

Part No.	Description	Qty
C43067	Venting Hose 50.8 mm (2") ID, 3.8 meters (12.5 feet) long	1
414742SP	Fuse, 10AF/250VAC Fast, 6.3 x 32 mm	1
415814SP	Air/N_2 Inlet Tubing, 6 mm OD	1
352281SP	Pressure Regulator	1
353480SP	Supply Connection Set	1

For a complete list, please visit our website www.biotage.com.

Manufacturer

Biotage GB Limited United Kingdom for
Biotage Sweden AB

Contact Us

Biotage Sweden AB
Box 8
SE-751 03 Uppsala
SWEDEN

Visiting address: Vimpelgatan 5

Phone: +46 18 56 59 00
Fax: +46 18 59 19 22
E-mail: info@biotage.com
Website: www.biotage.com

Please contact your local Biotage representative. See contact information on the back of this document or visit our website www.biotage.com.

Your Complete Partner for Effective Chemistry

Biotage is a worldwide supplier of instruments and accessories designed to facilitate the work of laboratory and process chemists. With our deep knowledge of the industry, academic contacts and in-house R&D teams, we can deliver the best solutions to your challenges. We take great pride in our flexibility and ability to meet our customer's individual needs. With strong foundations in both analytical, organic and process chemistry, we can offer the widest range of solutions available on the market.

EUROPE
Main Office: +46 18 565900
Toll Free: +800 18 565710
Fax: +46 18 591922
Order Tel: +46 18 565710
Order Fax: +46 18 565705
order@biotage.com
Support Tel: +46 18 56 59 11
Support Fax: + 46 18 56 57 11
eu-1-pointsupport@biotage.com

NORTH & LATIN AMERICA
Main Office: +1 704 654 4900
Toll Free: +1 800 446 4752
Fax: +1 704 654 4917
Order Tel: +1 704 654 4900
Order Fax: +1 434 296 8217
ordermailbox@biotage.com
Support Tel: +1 800 446 4752
Outside US: +1 704 654 4900
us-1-pointsupport@biotage.com

JAPAN
Tel: +81 3 5627 3123
Fax: +81 3 5627 3121
jp_order@biotage.com
jp-1-pointsupport@biotage.com

CHINA
Tel: +86 21 68162810
Fax: +86 21 68162829
cn_order@biotage.com
cn-1-pointsupport@biotage.com

KOREA
Tel: + 82 31 706 8500
Fax:+ 82 31 706 8510
korea_info@biotage.com
kr-1-pointsupport@biotage.com

INDIA
Tel: +91 11 45653772
india@biotage.com

Distributors in other regions are listed on www.biotage.com

Part Number: 415390-G

Biotage®