Genevac EZ-2 Elite Personal Evaporator

User Manual

Original instructions

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GeneVac
Evaporation pure and simple
Personal Evaporator


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Item	Feature	Function
1	***USB port***	(On side panel.) Data log files may be transferred to, method files may be transferred to or from a USB data key.
2	***LCD screen***	Menus allow quick access to everyday functions and intuitive guidance to advanced features.
3	***SET MAX TEMP °C***	Easily set the maximum sample temperature.
4	***SELECT control***	Twist to highlight menu options on the LCD screen, press to select.
5	***Start, stop, pause buttons***	Control the evaporation process using the selected method.
6	***Vacuum pump***	Low maintenance, super high vacuum pump provides wide solvent compatibility from low to high BP.
7	***Rotor***	Compatible with a wide range of Genevac sample holders which can accommodate most common sample formats: round bottom flasks (up to 500 ml in volume), tubes (up to 160 mm in length), custom reaction blocks and shallow or deepwell microplates. EZ-2 is also compatible with the revolutionary Genevac Sample Genie™ system.
8	***Lid***	Unlocks only when safet to open. Press the ***LID*** button and manually lift the lid to when a beep sounds.
9	***IR sensor access panel***	Easy access to the IR lamp when replacement is required.
10	***Auto drain condenser***	Highly efficient cold trap captures all solvent as liquid (even water) and drains automatically.
11	***Quick reference guide***	At-a-glance guidance to basic operation.

Safety

Warnings and cautions

This symbol is used within this manual to highlight ***Warnings*** and ***Cautions***.

Warning: highlights a risk of personal injury or material damage.

Caution: highlights a risk of material damage.

Risk assessment

Caution: Carry out a risk assessment for each solvent before use. Consider the possible consequences of applying vacuum to solvent mixtures, especially organic solvents. For example, H_2O_2 gives off O_2 under vacuum, creating an oxygen rich atmosphere.

Precautions

Observe the following safety precautions when using the evaporation system:

- Only operate the system in a ventilated space.
- Make sure exhaust / ventilation hoses are securely fitted and take solvent vapours away from the equipment and from the operator.
- Only use sample holders and / or swings that are approved for use by Genevac.
- Do not leave the system unevenly loaded, someone may start it.
- Do not start or restart a system without checking it is evenly loaded.
- Do not place objects on top of the evaporator.
- Check the condenser has been drained before starting the evaporator.
- Take care when removing the condenser jar. It is heavy when full of solvent.
- Inspect the condenser jar frequently. Do not use it if it is cracked or damaged in any way.
- Do not allow the condenser jar to fill above the ***MAX*** line.
- Do not leave samples in the evaporator before or after evaporation.
- Refer to the Genevac published list of acceptable solvents for solvent compatibility information.
- Clean up any solvent spillage immediately.
- Dispose of waste solvents in accordance with local environmental regulations.

Caution: Incorrect loading may result in damage to samples and to the system.

Only allow users who are familiar with all the issues outlined in this User Manual to operate the equipment. If personnel lack the training or experience to comprehend the hazards that can arise when operating the system, do not allow them to use it; personnel without such training require thorough instruction. The information contained within this User Manual may form the basis of such training.

Combustible solvents

Warning: Risk of vapour ignition. Only operate the system in a well-ventilated environment and consider safety when evaporating any combustible solvents. Genevac's position regarding the evaporation of such solvents, particularly with respect to the European ATEX directive, is available on our website, at www.genevac.com, or from your local Genevac representative.

Electrical earthing

Warning: Risk of electric shock. This equipment must be earthed. The evaporation system is a safety class I product according to IEC classification. It must never be used with any interruption to the safety earth conductor. For systems with multiple power leads, each lead requires a separate earth connection and must be plugged into a separate power socket which is connected directly into the laboratory electrical supply; do not use extension leads.

This equipment is an installation class II product and is intended to operate from a normal single-phase supply.

Emergency shutdown

All Genevac evaporators are designed to be safe with respect to samples when they are switched off in an emergency. The system will automatically vent and the rotor will spin down slowly when power is removed. To shutdown in an emergency, switch off the power sockets at the wall and unplug (or simply unplug if there are no switches). Users should familiarise themselves with the location of the connections to the mains supply and make sure the power sockets and plugs are always accessible.

Strong acids

Caution: Do not attempt to evaporate, HCl, thionyl chloride, or other acid chlorides, in non-HCl compatible evaporators.

The solvent compatibility of the EZ-2 Elite evaporator is indicated on the lid. If the lid is marked ***NOT HCl COMPATIBLE*** do not attempt to evaporate this class of solvent. If the lid is marked ***HCl COMPATIBLE*** the system is compatible with HCl.

Note: ***HCl COMPATIBLE*** implies only resistance to HCl vapours. Any liquid spillage should be cleaned up immediately and in compliance with your local solvent spillage procedures.

Low auto-ignition point solvents

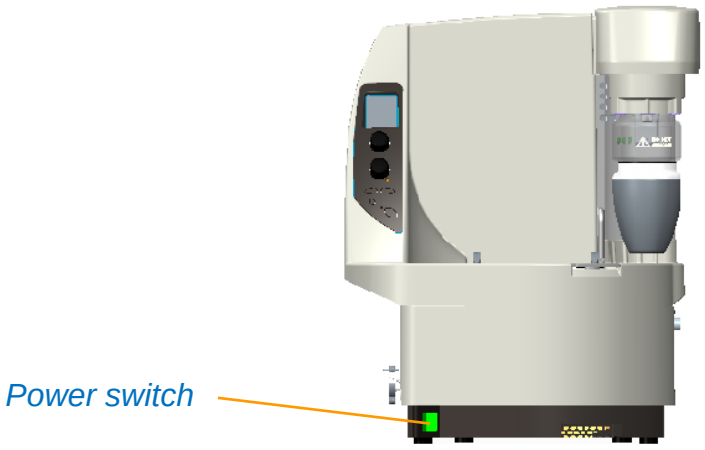
Warning: Risk of vapour ignition. Do not attempt to evaporate diethyl ether, pentane or other low auto-ignition solvents unless the evaporator is fitted with an inert gas purge system.

Basics

Power up

Before switching on, check that power is connected to the EZ-2 Elite via two power cables, as shown in: ***Service connections***.

Switch on the EZ-2 Elite using the power switch on the front.



The display shows: ***UPDATE MANAGER – LOOK FOR USB DATAKEY*** while the EZ-2 performs a short software self-test. The software version is then shown briefly before the EZ-2 Elite powers up fully.

Standby mode

While the system is idle, press the ***STOP*** button  to enter standby mode.

In standby mode:

- The backlight LCD screen shows the software version.
- The LCD screen back-light is switched off.
- The condenser is powered down.
- The lid cannot be opened.
- Methods cannot be viewed.
- Settings cannot be adjusted.

To restart the system, press any button.

The evaporator automatically switches to standby mode if inactive for more than one hour. This feature allows the system to be left unattended; it will evaporate the samples safely and turn itself off when done.

Controls

1. ***Display:*** LCD screen with back-light, provides icon, text and numeric information for programming methods and monitoring evaporation progress

2. ***SET MAX TEMP °C control:*** Turn to adjust sample temperature setting.

3. ***SELECT control:*** Turn and press to browse and select method options.

4. ***Start / Stop buttons:*** Press the appropriate button once to start or stop an evaporation.

5. ***Pause button:*** Press once to pause and again to restart an evaporation.

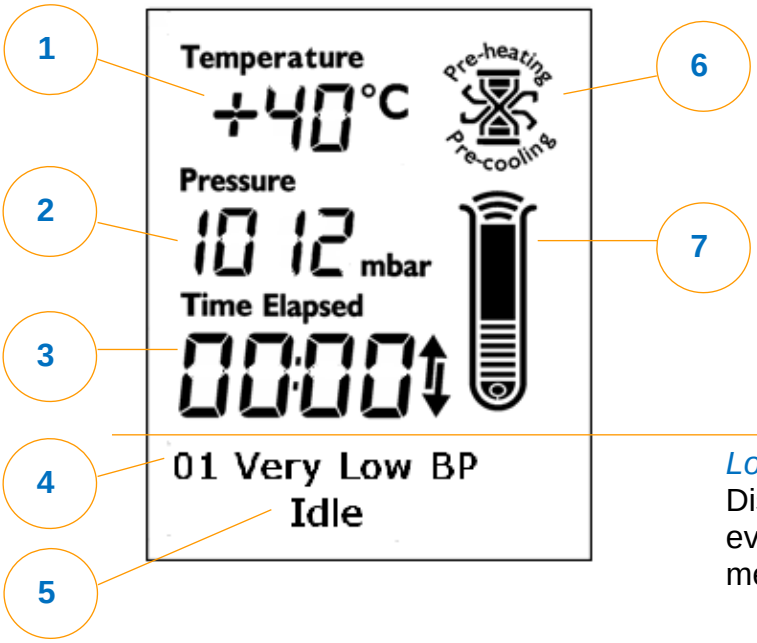
6. ***Lid LED:*** Green LED lights up when it is safe to open the lid.

7. ***LID unlock button:*** Press the button once to unlock the lid.

8. ***Dri-Pure LED:*** Yellow LED lights up when selected method includes a Dri-Pure stage.

LCD Screen

The LCD screen provides information relating to method selection, method progress or evaporator status.



Lower screen section
Displayed text relates to evaporator status, methods or errors.

1. ***Temperature:*** The sample holder temperature during evaporation.

2. ***Pressure:*** The chamber pressure, from atmospheric to ultimate system vacuum.

3. ***Time:*** The time remaining (when known) or the time elapsed. An arrow next to the displayed time indicates whether the timer is counting down (time remaining) or counting up (time elapsed). **Note:** Time remaining is unknown throughout most of the evaporation when the method setting: ***Run to AutoStop*** is selected.

4. ***Method description:*** Available methods and method parameters, interacts with the ***SELECT*** control to allow the user to browse and select settings.

5. ***Status:*** The current status of the evaporator. If a fault or error is encountered, a reference number and a brief description of the problem are shown.

6. ***System busy indicator:*** Animates to show when the system is waiting for a process to complete.

7. ***Progress indicator:*** Shows sample drying progress from 80% to 20% completion. Segments within the test tube icon extinguish sequentially, use this for approximate guidance only. A sample pellet icon, in the bottom of the test tube, flashes to indicate when the evaporation is complete.

Opening the Lid

The lid cannot be opened when the rotor is moving or when the chamber pressure is below atmospheric pressure. When the evaporator stops, a countdown timer appears on the display. If the ***LID*** button is pressed while the evaporator is operating, or during the countdown, a double beep sounds and the lid remains locked. The countdown also appears when the evaporator is first powered up.

When the countdown reaches 0, a short beep sounds and the ***lid LED*** lights up to indicate that the lid can be opened.

The lid also remains locked when the system is switched off or when the mains power is disconnected.

Getting started

The following guide is a quick reference reminder for getting started. For more detailed operating instructions and descriptions of features, refer to the relevant sections within this user manual.

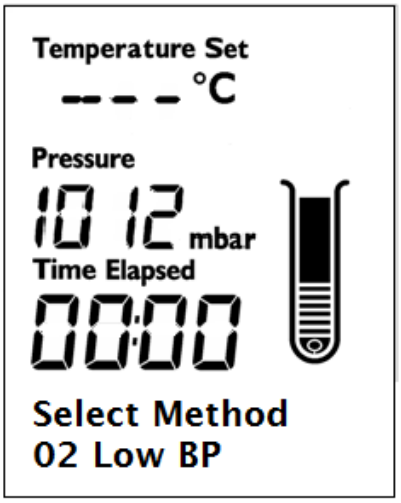
Start-up procedure

1. Switch on the power.
2. Press the ***START*** button and wait for the safety countdown to complete.
3. Make sure the condenser has been drained.
4. When the lid LED lights up, press the ***LID*** button.
5. Open the lid.
6. Load the balanced sample holders onto the rotor.
7. Close the lid.
   Using the ***SET MAX TEMP °C*** control, set the desired maximum temperature.
8. Using the ***SELECT*** control, select the required method.
9. Press the ***START*** button.

Selecting a method

In idle mode, turn the ***SELECT*** control. The available methods appear in the lower section of the LCD screen.

When the required method is shown, press the control to select it.

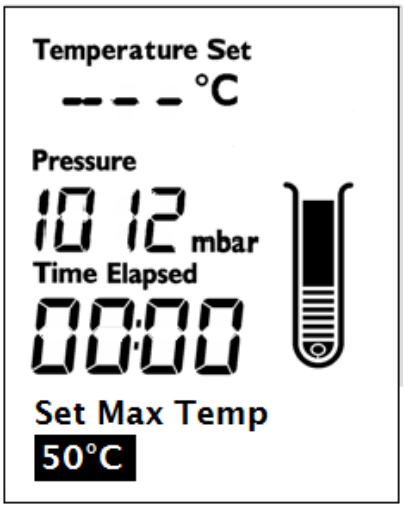


Sample temperature

Turn the ***SET MAX TEMP °C*** control to set the desired sample control temperature. The control temperature appears in the lower section of the LCD screen and increments up or down as the menu control is turned.

Stop turning when the desired control temperature is displayed, the new setting is accepted after a short time and the display reverts to showing the method status.

Once evaporation commences, the EZ-2 controls the temperature of the sample holders; the sample control temperature may be adjusted at any time during operation or when the EZ-2 is in idle mode.



Note: The evaporator controls the sample holder temperature. Due to evaporative cooling the actual sample temperature during evaporation may be considerably lower than the sample holder temperature. The sample control temperature should be considered the maximum temperature (or cut-off point) that the EZ-2 will allow the samples to reach.

Some methods specify a sample control temperature and will not allow adjustment by the user. For these methods, sample temperature control is locked out and the display shows a padlock icon if the user attempts to adjust the setting.

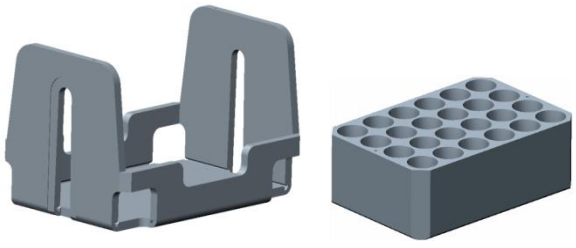
Loading Samples

Samples in the evaporator are subjected to accelerations of up to 500 g (a force equal to 500 times gravity) during evaporation. It is therefore important for the operator to understand the safety requirements and to gain familiarity with the safe loading procedure outlined below.

Sample holders

A range of sample holders is available to suite a wide variety of plates, vials, tubes, beakers, flasks, etc, as well as the revolutionary Genevac ***SampleGenie***™ system. Sample holders are interchangeable, lifting straight out of the rotor to allow samples to be loaded quickly and easily. Some sample holders are a one-piece integral holder and swing, others consist of a sample holder block, which fits into a separate swing.

Integral swing / tube holder



Tube holder and side bridge swing

To see the range of sample holders available, contact your local Genevac representative and request a ***Genevac Accessories Brochure***.

Use of correct accessories

Take care to make sure that the correct sample holders are used, follow this guidance at all times:

- Only use swings and sample holders that are approved for the system (it is particularly important to check this if more than one Genevac system is in use)
- Only use the tubes or vials that are approved for the sample holder (incompatible tubes may appear to fit a holder they could be too long when loaded onto the rotor)
- Use matched pairs of sample holders on opposing positions of the rotor
- Do not use sample holders intended for side-bridge swings in open swings (they may appear to fit but could be too tall when loaded onto the rotor).
- If using heat transfer plates, insert each plate into the swing with the flat metal base plate facing downwards so it contacts the swing (heat transfer plates are for use with microtitre plates only).

The ***Genevac Accessories Brochure*** indicates the maximum tube length that each holder can take and includes notes such as: *For use in side-bridge swing only*.

Note: Some Bohdan Miniblock system sample holders exceed the mass limitations of Genevac systems. If you plan to use Bohdan Miniblocks in a Genevac system, please contact Genevac for a list of the relevant weights.

Caution: With the exception of microtitre plates, do not load any non-Genevac holders into a system without gaining approval from Genevac.

Mass limit

The mass limit for Genevac EZ-2 evaporators is 1.5 kg per swing. This is the total mass that can be loaded onto each position of a swung rotor, and includes:

- The swing
- The sample holder
- The tubes or vials
- The sample solutions.

Do not exceed the mass limit under any circumstances. In most cases, with normal solvent volumes, loaded Genevac sample holders will fall within this limit. If in any doubt, load up a swing and weigh it.

Loading the rotor

Check the condition of sample holders and (where applicable) swings before loading them onto the rotor. Refer to ***Maintenance – Sample holders***.

When preparing sample holders to be loaded onto the rotor, do not exceed the maximum load capacity of 1.5 kg per swing. This is important as samples in the evaporation chamber can be subject to a centrifugal force approximately 500 times greater than gravity.

- Balance the sample holders to within 10 g.
- Distribute tubes in balanced configurations in the sample holders.
- Load the sample holders carefully, making sure they are located correctly on the rotor pins.
- Place both sample holder swings onto the rotor.

Rotate the rotor by hand. Check that all tubes, holders, plates, etc are correctly located and swings are able to swing freely. Only use the sample holders that were supplied with the system or are specified for use with the system; never use non-Genevac approved sample holders.

Note: Genevac Ltd cannot accept responsibility for any loss of samples or damage to the EZ-2 Elite incurred as a result of improperly or excessively loaded rotors.

Caution: Failure to load a system correctly can lead to unrecoverable sample loss or damage to the system. As with all centrifuges, Genevac centrifugal evaporators must be loaded correctly to remove the risk of damage.

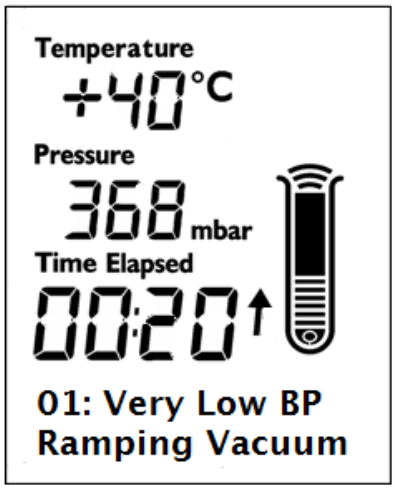
Starting the evaporator

Press the ***START*** button to begin evaporating using the selected method.

Note: Once the evaporator starts, the method may not be changed.

Evaporation in progress

On the LCD screen, a test tube graphic animates to show that evaporation is in progress and the time elapsed or (when known) time remaining is shown.



The Dri-Pure LED indicator lights up during Dri-Pure enabled methods. During the Dri-Pure part of a method, the display shows the message: ***Ramping Vacuum***.

The message: ***Defrosting*** may be displayed periodically during certain methods, this indicates the automatic defrost operation of the SpeedTrap.

A sample pellet icon, in the bottom of the test tube, flashes to indicate when the evaporation is complete.

Stopping

Automatic stop

The evaporator stops automatically when all stages of the selected method are complete. Automatic stop can be set to trigger when the ***Heatflow*** detection system senses a slow-down in the evaporation rate, or can be set to occur after a preset time. For heatflow to function adequately, 50% of the holder must be filled with samples, each tube must be at least 50% full and the ***sample temperature selector*** must not be set to ***LAMP OFF***.

The ***Heatflow*** method is inappropriate in situations where little or no heat is required from the IR lamp (such as when small volumes of volatiles are evaporated at low temperature). In this instance, the system runs for a pre-programmed time instead. The time required is mapped by the software and depends on the run selected and the control temperature. If user experience shows that the default time is longer than necessary, a shorter time can be set.

Manual stop

To stop the evaporator manually, press the ***STOP*** button. The evaporator vents to atmospheric pressure and the rotor slows down and stops. Defrost starts automatically.

Pausing

Press the ***PAUSE*** button to stop the EZ-2 Elite temporarily in order to examine the samples. To resume evaporation, close the lid and press the ***START*** button. If the ***STOP*** button is pressed, the EZ-2 Elite will reset and the evaporation cannot be resumed. ***Dri-Pure*** is not applied when resuming from paused, inert gas purge enabled evaporators will re-purge when the method resumes.

A defrost may be initiated manually while the EZ-2 Elite is paused.

Pump warm up

The following information only applies to methods that are specifically set up for HCl or other acids, and therefore normally only applies to HCl compatible systems.

In order to protect the vacuum pump from potentially harmful effects of acid solvent condensation, the system warms the pump to a safe operating temperature before allowing an evaporation to start. Pump warming begins when the evaporator is switched on and takes 30 minutes. If an HCl or acid specific method is selected and the ***START*** button is pressed during the warm-up period, the EZ-2 Elite spins the rotor to perform a balance test, then stops to wait for the pump to warm-up before beginning the evaporation, the warm-up time remaining time is shown on the LCD screen.

The system also warms the pump when restarted from standby; the warm up time is reduced proportionately if the system has only been in standby mode for a short time.

Pump purge

At the end of evaporation the vacuum pump continues to operate for a period to purge any potentially harmful solvents from the pump.

Caution: Do not switch off the EZ-2 Elite during the pump purge period; this may damage to the vacuum pump.

When the purge cycle is complete, the EZ-2 Elite automatically switches to standby mode.

Condenser

The condenser powers up when the evaporator is switched on and is deactivated if it enters standby mode. When powered, the condenser jar is illuminated by blue LEDs. The EZ-2 Elite does not allow evaporation to commence until the condenser has cooled down to operating temperature.

A section around the base of the glass jar illuminates green to indicate when the condenser is draining.

Caution: Do not attempt to remove the condenser jar assembly. The auto-drain condenser of the EZ-2 Elite operates differently from other EZ-2 systems. If removal of the condenser jar is necessary, contact Genevac Service.

Waste solvent

Waste solvents collect as liquid in the Condenser jar. Under certain conditions, ice may form in the jar. If this happens, select defrost. Waste solvent boiling and reflux in the condenser jar, during evaporation, is normal.

Automatic defrost and drain

Condenser defrosting and draining is fully automatic and occurs at the end of every evaporation, for some methods it also occurs periodically during evaporation. Once an automatic defrost and drain cycle commences it should be allowed to complete. If the ***START*** button is pressed to initiate a new evaporation during and automatic defrost and drain cycle, this takes precedence and the system starts immediately using the selected method.

The condenser drains automatically before starting evaporation. The opaque ring around the base of the condenser jar illuminates green to show when the condenser drain valve is open. Whilst defrosting, the display shows the defrost time remaining.

Defrosting of the condenser coil is independent from the condenser jar defrost, and occurs periodically during evaporation.

Manual defrost and drain

In addition to automated defrosting, an extended defrost cycle can be initiated manually while the evaporator is paused or in idle mode.

To activate ***manual defrost***, turn the ***SELECT*** control. When the display shows: ***Manual Defrost***, press the ***SELECT*** control. The condenser jar illumination flashes to show the defrost cycle is active. The defrost lasts for 30 minutes.

To cancel defrost, press the ***SELECT*** control or select a method and press the ***START*** button. The extended defrost cycle cannot be activated when the EZ-2 is evaporating, in standby mode, or reporting an error message.

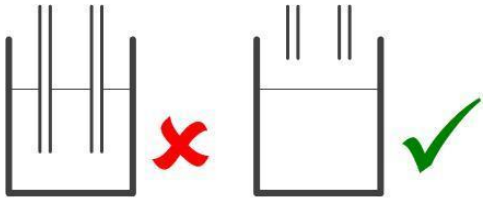
Condenser back-light

The condenser back light provides illumination so that the solvent level in the condenser jar can be seen, in addition the blue condenser backlight flashes to alert the user in various modes of operation. For more information, refer to: Troubleshooting - Visual alerts.

Waste solvent container

Check the condition of the waste solvent container, waste solvent drain hose and exhaust hoses regularly. Drainage of waste solvent into the waste solvent container by gravity must be unimpeded by kinks, sharp bends, uphill sections or other constrictions.

The waste solvent container must be below the level of the drain outlet and the ends of the hoses must not be below the maximum fill level for the waste solvent.



Always empty the waste solvent container and reconnect it to the system before starting the evaporator.

Note: The evaporator is supplied with a polypropylene waste solvent container. It is advisable to replace this with a glass container (2.5 litre with GL45 cap) before evaporating solvents that may attack polypropylene.

Caution: Waste solvent may drain periodically whilst the evaporator is operating. Do not start the evaporator with the waste solvent container disconnected, and keep the waste solvent container connected while the evaporator is operating.

Method Guide

The EZ-2 Elite is supplied from the factory with a number of methods preloaded. The factory-preloaded methods are listed below. If custom methods are installed, they replace some or all of the factory-preloaded methods.

Solvent groups

Factory loaded method	Solvent group description	Approximate boiling point (at atmosphere)
Very Low BP	Very volatile solvent where bumping is not expected (and THF)	< 50°C
Low BP	Volatile solvent where bumping is not expected	50 °C to 90 °C
Aqueous	Water based solutions where freezing at 0ºC is anticipated but bumping is not expected	100°C
High BP	Less volatile solvents where bumping is not expected (excluding water)	> 90°C
Very Low BP Mix	Mixtures of very volatile solvents where bumping may be expected	Volatile component(s) < 50°C, non-volatile < 90°C
Low BP Mix	Mixtures of volatile solvents where bumping can be expected	All components of mixture: 50°C to 90°C
Aqueous NH3 or Aqueous HCl	NH3 or HCl (if compatible) dissolved in water or MeOH	
High + Low BP	Mixtures with a volatile solvent that is prone to bumping and a less volatile solvent that requires low pressure to evaporate	Volatile component(s) < 90°, non volatile > 90°C
HPLC	Water / acetonitrile or water / methanol fractions	
HPLC Lyo	HPLC fractions for evaporation of volatile component and concentration, then lyophilisation of water	
System Test		

Acceptable solvents

Carry out a risk assessment for each solvent or solvent mixture before use. Solvents included in the following table are not damaging to the evaporator providing appropriate methods are used. Contact your local Genevac representative for advice before using solvents which are not listed or for information on obtaining custom methods.

Solvent		Acceptable?
Acetic acid	$MeCO_2H$	■
Acetic anhydride		■
Acetonitrile	MeCN, ACN	■
Amonium hydroxide	NH_3OH	■
1-Butanol		■
2-Butanol		■
Butanone	MEK	■
Butyl acetate		■
tert-Butyl alcohol	*tert*-butanol	■
Chlorobenzene		■
Chloroform	$CHCl_3$	■
Cyclohexane		■
1,2-Dichloroethane	DCE	■
Dichloromethane	DCM	■
Diethyl ether		p
Diisopropyl ether	DIPE	■
Dimethyl acetamide		■
N,N-Dimethyl formamide	DMF	■
Dimethyl sulfoxide	DMSO	■
1,4-Dioxane		■
Ethanol	EtOH	■
Ethyl acetate	EtOAc	■
Formic acid	HCO_2H	■
Heptane		■
Hexane		■
Hydrobromic acid	HBr	■

Solvent		Acceptable?
Methanol	MeOH	■
Methyl teriary butyl ether	MTBE	■
N-Methly-pyrrolidone	NMP	■
Pentane		p
1-Pentanol		■
Petroleum ether	pet ether	■
1-Propanol		■
2-Propanal	IPA, *iso*-propanol	■
Propanone	Acetone	■
Pyridine		■
Sodium hydroxide (aqeous)	NaOH	■
Tetrohydrofruran	THF	■
Thionyl chloride	$SOCl_2$	□
Toluene		■
Trichloroacetic acid	TCA	■
Triethylamine	Et_3N	■
Trifluroacetic acid	TFA	■
2,2,2-Trifluoroethanol	TFE	■
Water	H_2O	■
Water & Acetonitrile		■
Water & Methanol		■
Water & Ammonia		■
Water & HCl		□
Methanol & HCl		□
TFA & DCM		■

■ Solvent may be evaporated using EZ-2 Elite
□ Only compatible if EZ-2 Elite is HCl resistant
p Only compatible if EZ-2 Elite has an inert gas purge system

Choosing the right method

Each factory-preloaded method is designed to provide optimal evaporation conditions for a specific group of solvents or solvent mixtures. Method selection is intuitive, most method names being based on solvent boiling points.

Refer to the tables on the previous pages to place a solvent in a solvent group and or to look up the most suitable method for a given solvent. For solvents that may be considered borderline, or may fall into more than one solvent group, two methods are recommended in the Solvent groups table. In these cases, the first method generally provides better solvent recovery; the second may facilitate slightly quicker drying times.

By default, almost all methods are configured to evaporate samples to dryness. If you require to concentrate rather than dry, please contact your local Genevac representative who will be happy to assist in optimising a method.

Note: When choosing a method, the boiling point of the solvent(s) under vacuum is critical, although a solvent has a relatively low boiling point at atmospheric pressure, its behaviour under vacuum may differ.

For further advice on selecting and optimising methods, please contact your local Genevac representative or email: applications@genevac.com

Solvent mixtures

When evaporating solvent mixtures, select the evaporation method suitable for the lowest boiling point solvent. For example, for:

- DCM / methanol mixtures use: ***Low BP Mixture***.
- DMF / DCM mixtures use: ***Med + Low BP Mixture***.

Low solvent volumes

Where the volume of solvent is low or the number of sample tubes is small, the EZ-2 automatic stop facility may not work. For further information, refer to: ***Advanced Operations***: ***Automatic stop limitations***.

Custom methods

Your local Genevac agent is able to supply custom methods, which can be easily installed, for specific or unusual applications. When new methods are installed they replace some or all of the factory-preloaded methods. For instructions on how to install, refer to: ***Advanced Operation – File transfer***.

Advanced Features

The EZ-2 Elite is supplied from the factory with a number of methods pre-loaded. Each method incorporates a set of control parameters that optimise the evaporator for use with a particular group of solvents. Refer to: **Error! Reference source not found.** for urther details. Most method parameters are fixed (as they define that method) but some are variable and may be changed by the operator to provide greater flexibility.

Custom methods may be installed prior to delivery, or at any time during the life of the EZ-2 Elite.

File transfer

The file transfer function allows new methods to be transferred to the EZ-2 via a USB data key (not supplied).

To copy method from a USB data key to the EZ-2:

1. Create a root folder called ***EZ2*** on a USB data key and copy the method files to it.
2. Plug the data key into the USB port (located on the left hand side of the EZ-2).

3. Turn the ***SELECT*** control until ***File Transfer*** appears in the lower part of the screen, then press the ***SELECT*** control.
4. Follow on-screen instructions to select the method(s) required (individual methods from 1 to 10 may be selected or ***all methods*** may be selected).

Note: This function is only available on EZ-2 evaporators with a USB port

Adjustable method parameters

Method parameters may be adjusted in order to optimise the evaporator for specific applications:

- ***Time to Final Stage***.
- ***Final Stage Time***.
- ***Reduce Odour***.

These parameters may be adjusted at any time, including when the evaporation is in progress. Any changes made to the method parameters will apply to any future use of the method.

Use the ***SELECT*** control to browse the available options and enter the required settings. The new setting is accepted after a three second thinking time delay; acceptance is confirmed by a short beep.

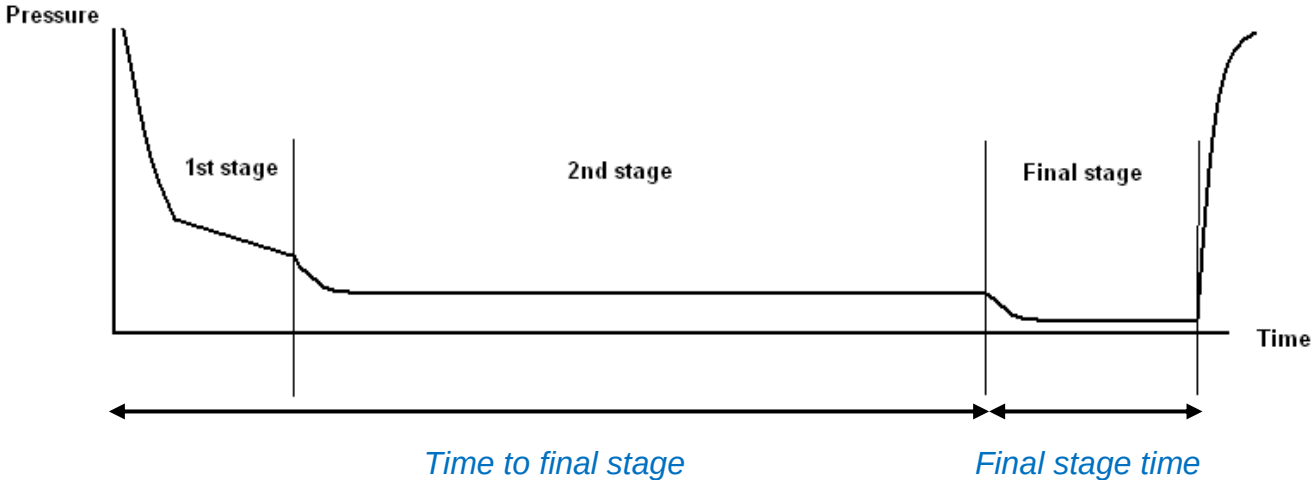
When parameters are adjusted while evaporation is in progress, the following rules apply:

- The time elapsed is not reset.
- The method advances to a later stage if the new stage time exceeds the time already elapsed.
- The evaporation stops immediately if the new total-method-time exceeds the time already elapsed.

The maximum sample temperature can also be adjusted at any time, using the ***SET MAX TEMP °C*** control. The new temperature setting is accepted immediately.

Time to final stage

The ***time to final stage*** is the total duration of all the method stages that lead up to the ***final stage***. The following example of pressure control during a multi stage method shows a Dri-Pure stage (1st stage) followed by an evaporation stage (2nd stage) and a final drying stage (Final stage).



In this example, any alteration to the time to final stage affects the duration of both 1st and 2nd stages, the allocated time (or time to final stage) being divided proportionately between them.

Note: When setting the time to final stage, make sure enough time has been allocated for any ***Dri-Pure*** stages.

Options

Select one of two options for time to final stage:

Preset: May be a specific time defined within the method, or may be automatic detection using ***HeatFlow***.
hh:mm: Adjust the time setting manually.

How to set

1. Turn the ***SELECT*** control until the display shows: ***Time to Final Stage***.
2. Press the ***SELECT*** control to browse the options.
3. Turn the ***SELECT*** control to increment the time setting up or down, or set time < 0 to select ***Preset***.
4. Press the ***SELECT*** control to enter the setting.

Final stage time

Samples may be subjected to a final drying stage, which commences after automatic stop is triggered or the pre-set time elapses., then the EZ-2 Elite vents and the rotor slows down and stops. Altering the ***Final Stage Time*** does not affect the preceding stages.

Options

Select one of two options for final stage time:

Preset: A time setting contained within the method.
hh:mm: Adjust the time setting manually.

How to set

1. Turn the ***SELECT*** control until the display shows: ***Final Stage Time***.
2. Press the ***SELECT*** control to browse the options.
3. Turn the ***SELECT*** control to increment the time setting up or down, or set time < 0 to select ***Preset***.
4. Press the ***SELECT*** control to enter the setting.

Reduce odour

The ***Reduce Odour*** function adds a repeated vent and vacuum cycle to the end of a method, which purges the evaporation chamber of residual solvent vapours. Select ↑ ***100 mbar*** for low boiling point solvents, select ↑ ***50 mbar*** or ↑ ***20 mbar*** for higher boiling point solvents. Experimentation may be required to find the most effective settings for specific solvents.

For further information, visit www.genvac.com to download a copy of the applications note: ***Eliminating Odours***.

Options

Select one of four options:

- ***Off***
- ↑ ***100 mbar***
- ↑ ***50 mbar***
- ↑ ***20 mbar.***

Note: Only setting options appropriate for the selected method are available.

How to set

1. Turn the ***SELECT*** control until the display shows: ***Reduce Odour***.
2. Press the ***SELECT*** control to browse the options.
3. Turn the ***SELECT*** control to change the ***Reduce Odour*** setting.
4. Press the ***SELECT*** control to enter the setting.

Set max temp

To view the sample control temperature setting for the currently selected method, turn the ***SELECT*** control until the display shows: ***Set Max Temp***. Then press the ***SELECT*** control.

Note: If the sample temperature control is locked out by the method, this is the only way to view the target temperature setting.

Method ID

Each method has a unique identification. To view, turn the ***SELECT*** control until the display shows: ***Method ID***. Then press the ***SELECT*** control.

View method

Parameters of the selected method can be viewed using the ***SELECT*** control. ***Global*** parameters apply to the entire method, ***Stage #*** parameters apply only to the specified stage.

System information

To view the current pressure inside the vacuum system or the condenser gas temperature, press the ***SELECT*** control and turn untill the display shows ***System information***, then press and turn to display either ***Pressure*** or ***Gas Temperature***.

Dri-Pure®

Methods for low boiling point solvents or solvent mixtures, include a ***Dri-Pure®*** stage. When a Dri-pure enabled method is selected the Dri-Pure LED indicator lights up on the control panel and vacuum ramping is controlled to prevent samples bumping during the initial evacuation of the chamber.

Wait to cool

Methods designed for low boiling point solvents or solvent mixtures may also include a ***Wait to Cool*** stage. The system checks the evaporation chamber temperature, if the chamber temperature is not within a specified range the system waits for it to cool before allowing the evaporation to proceed, further minimising the risk of sample bumping. A cooling fan circulates air around the outside of the evaporation chamber to assist the process.

During the Wait to Cool stage the rotor spins, the display timer icon animates, and the message: ***Wait to Cool*** appears on the LCD screen.

Wait to heat

Before an evaporation method commences, the EZ-2 Elite checks the evaporation chamber temperature. If the chamber temperature is not within a specified range, the system automatically selects a ***Wait to Heat*** stage.

Pre-heating prevents the condensation of medium boiling point solvents on the chamber walls; the required chamber temperature range is defined within the selected method.

During the wait to heat stage, the rotor spins, the display timer icon animates and the message: ***Wait to Heat*** appears on the display.

Inert Gas Purge

The inert gas purging system displaces air in the evaporator with inert gas prior to starting the evaporation run, it also vents with inert gas at the end of evaporation process. Oxygen levels within the vacuum system are maintained safely below the minimum level that would be required for the combustion of solvents.

After the evaporator stops, an inert gas blanket can be maintained to prevent samples reacting with elements in the air.

Warning: Risk of asphyxiation. Inert gas will leak from the evaporator during operation. Only operate the evaporator in a ventilated environment.

Gas must be available to maintain the specified pressure and flow rate for the duration of the evaporation. If inert gas is supplied from a bottle, make sure there is sufficient gas in the bottle before starting the evaporator.

Do not switch off the evaporator or the inert gas supply until the evaporator has stopped, the condenser has been drained and samples have been removed.

Inert gases

Nitrogen or argon (which must be dry) are suitable for use with the inert gas purge system. Consult your Genevac representative for advice before using an alternative gas.

Set Password

An ***Inert Gas Purge Password*** can be set to prevent unauthorised or unintended deactivation off of the inert gas purge system. The factory setting is “0000” but can be changed to any combination of letters and digits.

To change the IGP password, go to the ***Maintenance*** menu and select ***IGP Password***. The current password must be entered before the new password can be set.

Inert gas purge enable

When enabled, Inert Gas Purge activates before every evaporation, regardless of which method is selected.

Purging takes approximately seven minutes, during which time a countdown timer appears on the LCD screen.

To enable or disable inert gas purge, go to the ***Maintenance*** menu and select ***Inert Gas Purge***. The function can only be enabled or disabled if the IGP Password is known.

When starting an evaporation with inert gas purge enabled, the message "***Please open the lid***" may appear on the screen . Opening the lid allows the system to take an atmospheric pressure reading. During the process the screen displays ***Please wait***. Once complete, the screen displays ***Please close the lid*** and then ***Please press start button***. The process may take up to 15 minutes or may take place unnoticed if the lid is open for long enough while samples are being loaded, and is started within 15 minutes of the lid being closed.

Note: When Inert Gas Purge is enabled, Inert Gas Blanket is automatically enabled, however when Inert Gas Purge is disabled, Inert Gas Blanket remains enabled.

Inert gas blanket

After the evaporator stops, inert gas is flushed into the evaporator to prevent samples reacting with elements in the air; an additional benefit is that the inert gas is dry.

When enabled, Inert Gas Blanket activates at the end of every evaporation, regardless of which method is selected.

The inert gas blanket is maintained by a five-second inert gas "puff" which occurs once every two minutes.

Do not switch off Inert Gas Blanket until condenser draining is complete.

To enable inert gas blanket, go to the ***Maintenance*** menu and select ***Inert Gas Blanket***.

Note: If both Inert Gas Blanket and Reduce Odour are enabled, Inert Gas Blanket overrides Reduce Odour.

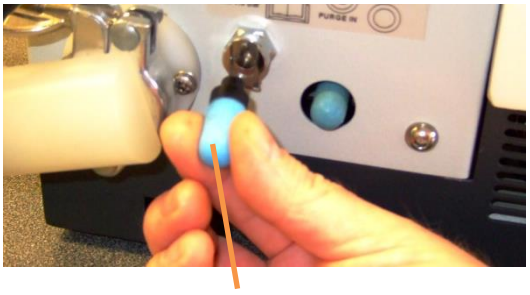
Disconnection

While Inert Gas Purge and Inert Gas Blanket may be disabled from the Maintenance menu, the evaporator will continue to vent with inert gas as long as the inert gas supply remains connected to the evaporator.

For temporary use with IGP disabled, disconnection of the inert gas supply is optional; however the gas supply may be disconnected if the use of IGP is no longer required.

To disconnect, turn off gas supply, then disconnect the inert gas hose (press the quick release tab and pull the hose connector away from the EZ-2 Elite).

Fit the IGP disconnection filter (supplied) to the vent inlet.



IGP disconnection filter

Caution: Failure to fit an IGP disconnection filter may result in damage to the vacuum system.

Maintenance

Any maintenance or repair of this product, other than that specified within this user manual, must be carried out by Genevac personnel (or approved representatives of Genevac) using only approved spare parts.

Warning: Risk of contamination. Solvents can condense in the exhaust line. Wear suitable personal protective equipment when carrying out maintenance procedures, this is particularly important for HCl compatible systems.

Warning: Risk of electric shock. Live voltages are exposed when access covers are removed. Isolate the EZ-2 Elite from the mains supply before removing access covers.

Recommended practice

Maintain a solvent vapour free environment around the evaporator. Do not use the free space around the instrument for the storage of vessels containing solvents or acids. This instruction applies, even if the EZ-2 Elite is installed in a fume cupboard.

Before use

- Check / empty the exhaust catch pot as necessary.
- Check / drain the condenser.
- Check the condition of sample holders and (where used) swings before every use.

To help protect the vacuum pump, enable the ***Reduce Odour*** function before evaporating strong acids.

After use

Drain the condenser after every use.

After evaporating strong acids, clean the evaporation chamber and sample holders thoroughly, see ***General cleaning*** and ***Sample holders***. To remove contamination from parts of the system that cannot be reached, load the EZ-2 with approximately 200 ml of methanol and flush by evaporating at 40°C using a low BP method with ***Reduce Odour*** enabled.

Cleaning and flushing with methanol will help to protect the vacuum pump and maintain the evaporator's performance, it is strongly recommended to perform this cleaning regime before switching from the use of acid to base solvents or vice versa.

Cleaning should also be performed if any trace of solvent is evident on the inside of the evaporation chamber, or if any solvent is spilled. Refer to the instructions below for ***General cleaning*** and ***Cleaning sample holders***.

System test

The ***System test*** method can be used to verify the correct operation of the IR lamp, and to test the ultimate vacuum of the system.

1. Load empty sample holders onto the rotor
2. Check / drain the condenser
3. Set the sample temperature to approximately 60°C
4. Select ***System test***
5. Press the ***START*** button 

Observe the IR lamp by looking through the window in the EZ-2 Elite lid. The IR lamp switches on once vacuum is achieved. If the IR lamp fails to switch on, refer to the ***Maintenance*** section for instructions on how to replace the IR lamp.

Caution: To avoid overheating the EZ-2 Elite rotor mechanism when no samples are loaded, turn the ***SET MAX TEMP °C*** control to ***LAMP OFF*** once the lamp operation is verified.

To facilitate pressure calibration by Service Engineers, the system controls at 45 mbar for 10 minutes, then reaches ultimate vacuum after approximately 30 minutes (software V1.01 onwards). If the vacuum fails to reach a sufficient level, contact Genevac service for advice.

Periodic maintenance

Check the condition of the exhaust hose and waste solvent drain tubes:

- Make sure the exhaust hose takes solvent vapours away from the system safely. Avoid forming U-bends in the pipe as this could cause condensed solvent to gather and block the line.
- Make sure that waste solvent drains freely. The drain hose should not have any sharp bends or up-hill sections that could impede drainage of the waste solvent. The waste solvent container must be below the level of the wast solvent drain outlet.

For high boiling point solvents such as DMSO, NMP, DMF and DMI the best evaporation rates are achieved at pressures better than 0.5 mbar; a gradual decline in system performance may not be noticed if it occurs over a period of time. In order to monitor system performance, Genevac recommend keeping a log of the time taken for the system to reach full vacuum and the ultimate vacuum achieved.

If any deterioration in performance is noticed, firstly check that all users are adhering to the ***Before use*** and ***After use*** checks, and ***General cleaning*** instructions listed above. Also check the security of all clamped joints (but do not over tighten).

General cleaning

Cleaning should be performed as and when required, depend on the solvents being used this may range from monthly to following every use.

Inspect the following parts frequently and clean when necessary:

- Rotor
- Lid seal
- Inside of the evaporation chamber
- Underside of the lid
- IR lamp glass.

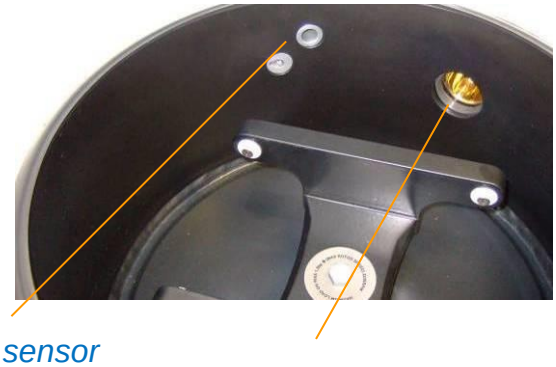
Use ethanol or methanol applied to a paper towel or soft, lint free cloth. If the system has been in contact with biological agents, a cloth dampened with bleach solution may be used.

For routine cleaning, the IR lamp lens may be cleaned in situ. If excessive contamination has occurred, the IR lamp and lamp lens will have to be removed for thorough cleaning or replacement.

Refer to: ***IR lamp and Lamp glass assembly***.

IR sensor

Clean the IR sensor using methanol or ethanol applied to a cotton bud or similar implement.



IR sensor

IR lamp glass

Sample holders

Clean the sample holders regularly or following any incident that involves glass breakage or solvent spillage.

Note: The most common cause of repeat glassware breakage is fragments, from a previous breakage, which have become stuck to the sample holder wells.

Visually inspect the swings and sample holders to check for any spilled solvent or debris, especially in the sample holder wells. Spilled solvent can cause debris to stick to the sample holders, causing high points that stress the glassware.

Clean off any adhered dirt or debris by washing the sample holders in soapy water or using a cleaning solvent such as methanol or acetone. The sample holders should then be rinsed in clean water. Alternatively, wash in a dishwasher at 90°C. Check to make sure that all adhered dirt, debris or solvent residue is removed. Always dry the sample holders thoroughly after cleaning and never place wet sample holders in a Genevac system.

The colouring of sample holders may vary, in addition repeated use of sample holders with strong acids may cause colour fading over time; this is normal and does not affect the performance or integrity of the sample holders.

Caution: Excessive build up of deposit on the pivoting faces of the sample swings and rotor can cause the sample swings to stick in the out position when the rotor stops, resulting in unrecoverable sample loss.

Caution: Scratches or superficial damage on the surface of sample holders will not affect performance, however if there is any structural damage (if any part of the swing or sample holder is bent or deformed, or if there is any sign of a crack) do not use it. Contact Genevac Service for evaluation.

Inert gas purge systems

Components of the inert gas purge system should be replaced annually; this can be done by Genevac as part of a planned maintenance schedule. The operator's risk assessment should consider the use of low auto ignition point solvents and should include provision for maintenance and testing.

In the unlikely event of solvent detonation occurring, internal components must be checked, and where necessary, replaced before continuing to use the evaporator. Contact Genevac Service for assistance.

Planned maintenance and servicing

Whilst every effort is made to design and manufacture evaporation systems to the highest possible standard, there will be some degree of degradation due to wear and ageing of parts such as seals and bearings within the evaporator, condenser and pump. The extent of wear and ageing depends on the use of the system, the severity of temperature cycling and the nature of the solvents used. In addition, some solvents may eventually cause pinhole corrosion in the connecting tubes, resulting in a decline in performance.

In order to maintain peak performance and avoid costly and unscheduled down time, Genevac strongly recommend implementing a schedule of planned maintenance. Changing parts in the field is complex and requires a high level of skill. Genevac offers a range of preventive maintenance, service and breakdown contracts designed to keep the equipment in top condition.

IR lamp assembly

Description	Part number
Lamp assembly (non-HCl)	70-1116/S
Lamp assembly (HCl)	70-1156/S
IR lamp only	AC9060

Note: Lamp assemblies consists of lamp, lamp holder, glass and seals.

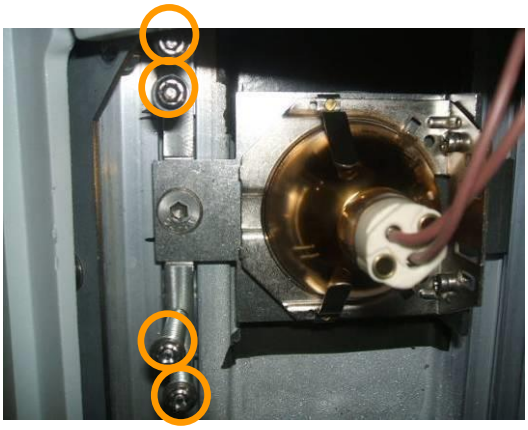
Warning: Risk of burns. The IR lamp and surrounding areas may be hot after system has been in use. Allow the IR lamp to cool before proceeding.

IR Lamp - removal

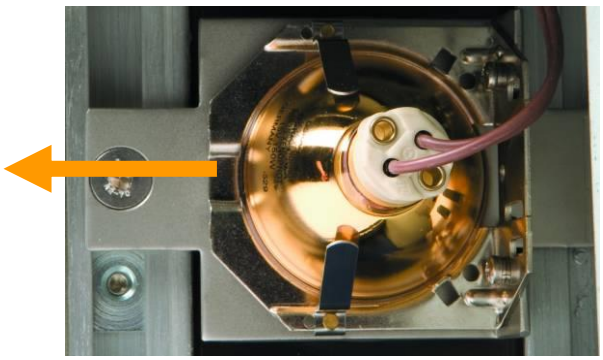
1. Open the lid.
2. Isolate the EZ-2 from the mains power supply.
3. Using a 4 mm Allen key, unscrew three securing screws and remove the lamp access panel from the right-hand-side of the EZ-2.

Lamp access panel removed

Caution: For EZ-2 systems with inert gas purge, do not attempt to adjust or remove the four spring loaded bolts near the IR lamp assembly.

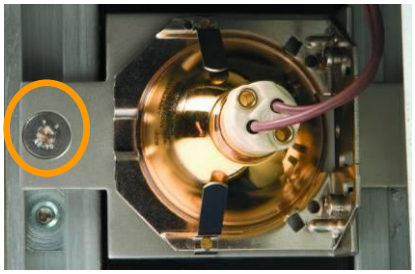


1. Gently pull the ceramic connector to disconnect electrical connector from the IR lamp (do not pull on the electrical wires).
2. Slide the IR lamp to the left and withdraw it from the retaining clip.



Lamp glass assembly - removal

1. Using a 4 mm Allen key, remove the lamp glass assembly retaining screw.



2. Gently pull the left-hand-side of the lamp glass assembly away from the EZ-2 chamber and disengage the retaining clip on the right-hand-side.
3. Remove the lamp glass assembly from the EZ-2.

Refitting

1. Check all parts are clean and undamaged, also check the sealing face of the EZ-2 chamber is undamaged.
2. Fit the lamp glass assembly to the EZ-2, make sure the O-rings are properly seated, hold the assembly in place while refitting the lamp glass assembly retaining screw.
3. Slide the IR lamp sideways into the retaining clip.
4. Carefully push the ceramic connector onto the IR lamp contacts.
5. Refit the lamp access panel with three securing screws.
6. Reconnect the mains power supply.

Testing

7. Select System Test.
8. Set the sample temperature to 60ºC
9. Press the ***START*** button.
10. Check that lamp illuminates.

Lid seal

Description	Part number
Lid seal	04-5094/S

Warning: Risk of contamination. Solvent traces may be present that could be harmful to health or lead to material damage.

Removal

1. Switch on the EZ-2.
2. Press the ***lid unlock*** button and open lid.
3. Check for solvent traces wipe the lid seal clean before removal.

Note: The seal material may absorb significant quantities of some solvents.

4. Manually remove the lid seal from the chamber by carefully pulling the seal away from the chamber. Do not use tools that may damage the chamber coating.

Refitting

1. Unpack the replacement lid seal.
2. Position the new lid seal on top of the vacuum chamber wall with 'lip' pointing towards the centre.
3. Firmly work the lid seal into position using only fingers, press the seal fully home.

Testing

1. Close the lid.
2. Select ***System Test***.
3. Set the sample temperature to 60ºC
4. Press the ***START*** button.
5. Ensure that the pressure drops below 500 mbar and continues to drop.

Note: Manual pressure may be required on the lid to assist to the new lid seal to bed in on the first use. If the pressure fails to drop, check the lid seal is correctly located on the vacuum chamber and repeat the test.

6. Allow the method to continue and check that normal operating pressure is achieved.
7. After running for approximately 30 minutes, stop the EZ-2, reseat the lid seal and repeat points 1. to 5. of the test procedure.

Note: An instructional video is available for viewing on the Genevac website.

Software upgrade

Systems with USB port

For EZ-2 Elite evaporators with a USB port, software upgrades may be sent by Email and uploaded to the EZ-2 Elite via a USB data key.

If a software upgrade is required, full instructions will be provided, your local Genevac representative will be happy to provide you with details.
To upload software:

1. Copy the software upgrade files to a USB data key.
2. Switch off the EZ-2 Elite.
3. Insert the USB data key into the USB socket (located on the left hand side of the EZ-2 Elite

4. Switch on the EZ-2 Elite.
5. When the screen shows ***START TO INSTALL – STOP TO CANCEL***, press the ***START*** button.

On completion, the screen shows ***UPDATE COMPLETE***.

Systems without USB port

For systems built before March 2014 (serial numbers up to 3697) software updates can be sent on a data key.

Software data key

To upload software:

1. Switch off the EZ-2 Elite.
2. Remove the EZ-2 Elite lower serial port blanking cap (located on the back of the EZ-2 Elite).
3. Plug the ***software data key*** into the serial port.
4. Switch on the EZ-2 Elite.
5. The new software version loads automatically.

Note: The uploading process takes several minutes, during the process the display shows:
SEARCHING FOR SOFTWARE UPDATE
UNINSTALLING CURRENT SOFTWARE
INSTALLING SOFTWARE UPDATE

6. When uploading is complete, remove the Data key.
7. Refit the EZ-2 Elite serial port blanking cap.

Unpacking and Setting Up

The evaporator and accessories and the vacuum pump are packed in two separate boxes. Upon receipt of the equipment, please check the packaging for damage before signing for it. If there is any damage, contact the Genevac Service department or your local distributor immediately. Refer to the Genevac website: www.genevac.com for up to date contact details of Genevac representatives.

Packaging

To unpack the wooden crate, undo the lid retaining screws and remove the lid. Undo the screws from the base of the timber sleeve and carefully lift the sleeve clear of the evaporator.

Where possible, retain the packaging. In the unlikely event that the EZ-2 Elite needs to be returned to Genevac, the packaging can be reused. Replacement packaging may be supplied but will be subject to a charge for the material and any shipping costs incurred.

Lifting

Make sure enough people are present to share the lifting safely. Carefully lift the EZ-2 Elite slightly at first to feel the weight and to find the centre of gravity. When ready, manually lift the EZ-2 Elite into position using the handholds in the base. Alternatively, use mechanical lifting equipment such as a lifting table or forklift.

Caution: The handholds are for manual lifting only. Do not insert lifting forks into the handholds.

Left side hand-holds

Right side hand-hold

Installation site

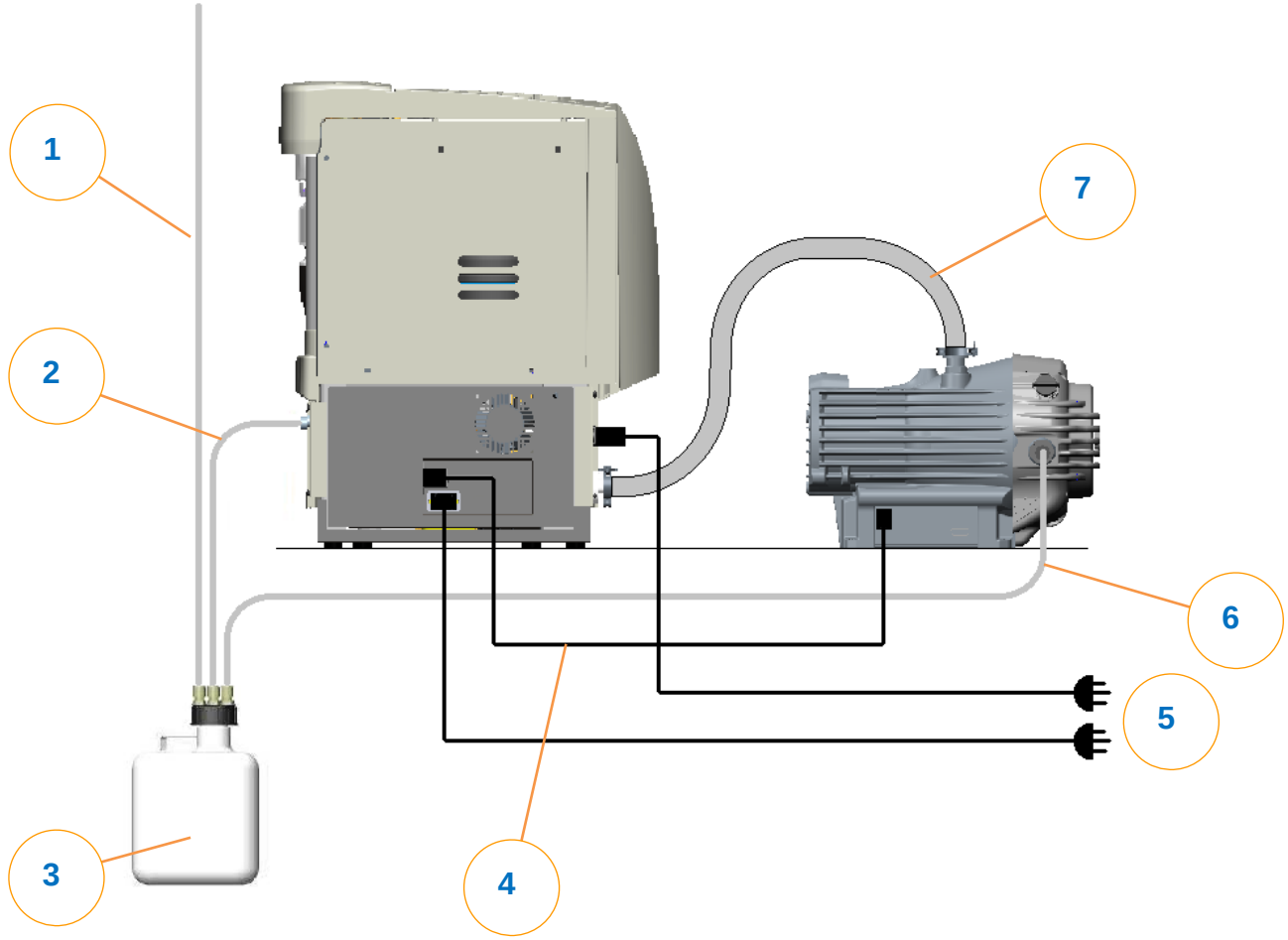
The evaporator must be placed on a level and sturdy work surface with a 50 mm air gap between the evaporator and the edge of the bench or any other object.

Service connections

The vacuum pump is connected to the evaporator by a vacuum hose and electrical control cable which are approximately three metres in length.

The waste solvent container must be positioned to allow unimpeded drainage of solvent from the evaporator and should be easily accessible for emptying.

There must be provision to connect the exhaust (PTFE hose: 6 mm ID, 8 mm OD) to a suitable laboratory fume extraction system and to connect two power cables to mains power outlets.



1. Exhaust to fume extraction
2. Condenser drain hose
3. Waste solvent container
4. Pump control cable
5. Two power cables
6. Pump exhaust hose
7. Vacuum hose

Note: The EZ-2 Elite may be placed in a fume cupboard. To maintain a vapour free environment around the EZ-2 Elite, do not store vessels containing solvents or acids within the fume cupboard.

Setting up

Place the drip-plate in the recess to the right of the lid.

Vent filter

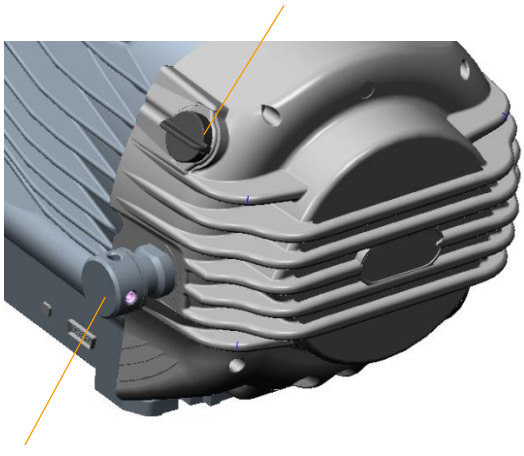
Taking care to avoid dropping the vent filter inside the EZ-2 Elite casing, insert the vent filter into the hole at the bottom of the side service panel and screw it onto the threaded connector.

Vacuum pump

Set the pump gas balast control to position “1” (as shown).

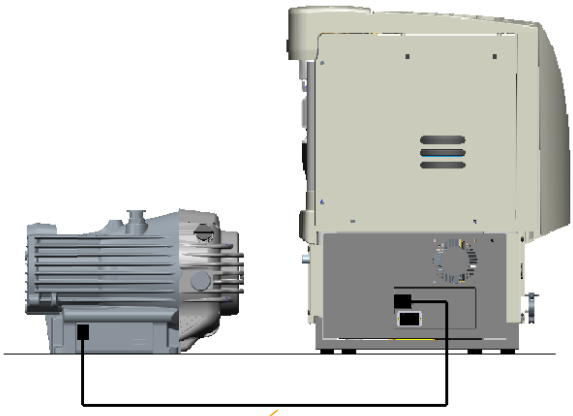
Push the exhaust adapter firmly into the pump exhaust outlet and twist it so the outlet faces the desired direction.

Gas ballast



Exhaust adapter

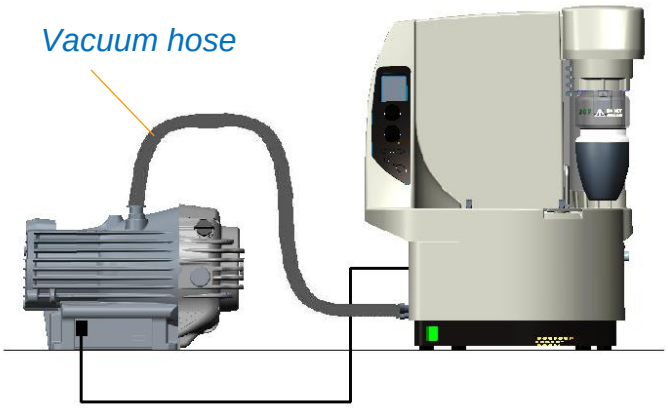
Using the pump control cable, electrically connect the vacuum pump to the evaporator.



Pump control cable

Using the Klein Flange connectors and three metre vacuum pipe, connect the vacuum pump to the evaporator vacuum inlet.

Vacuum hose



Waste solvent drain hose

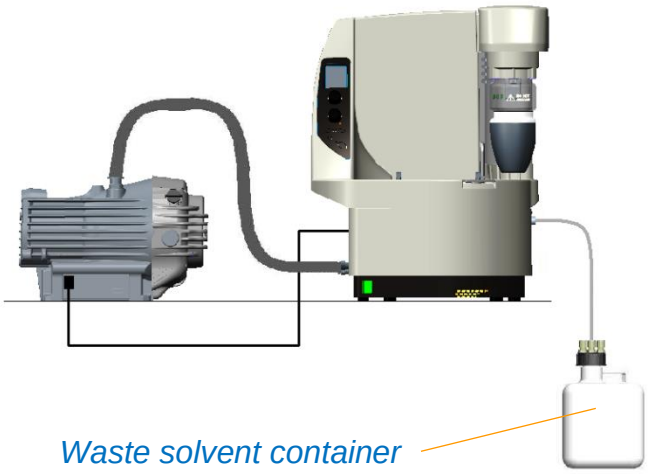
PTFE hose (6 mm ID, 8 mm OD) is supplied to form the waste solvent drain and exhaust hoses.

Slide a finger nut and shouldered compression ring over the end of a PTFE hose and connect the hose to the evaporator waste solvent outlet.

Place the waste solvent container in its intended location (usually on the floor in front of the evaporator).

Note: The drain hose must allow unimpeded drainage of waste solvents into the waste container, by gravity. The waste container must be below the level of the waste outlet, there must be no sharp bends, loops or upward inclination of the drain hoses and the waste container must have sufficient capacity to handle solvent throughput.

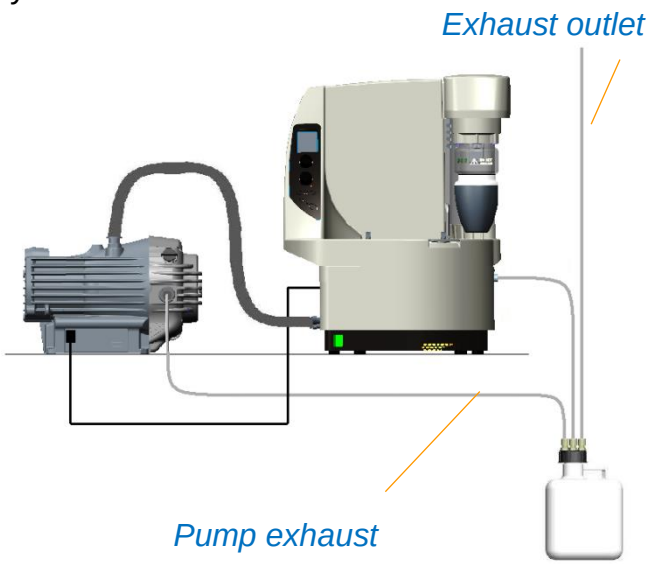
Cut the waste solvent drain hose to the required length and connect it to one of the three ports of the waste solvent container cap.



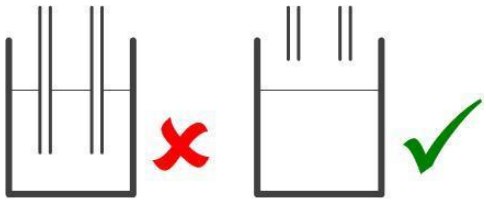
Exhaust hose

Using PTFE hose, connect the pump exhaust to the waste solvent container.

Connect the third port of the waste solvent container to the laboratory fume extraction system.

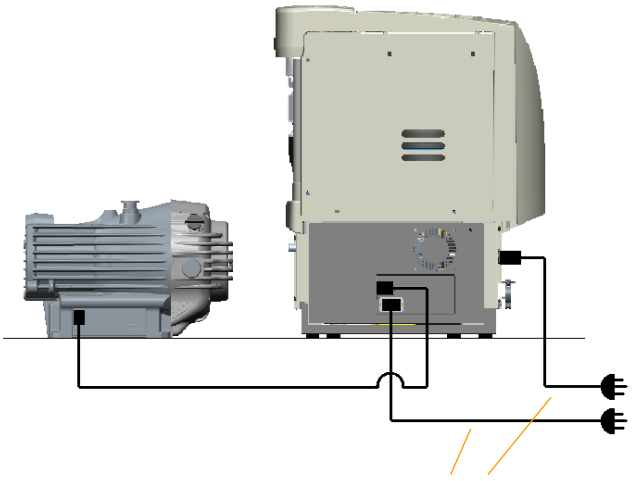


To prevent drain failure or the possibility of waste solvent being drawn back up the drain hose, make sure the ends of the hoses are above the maximum waste solvent level.



Connections to the waste solvent container should be sealed to prevent leakage of exhaust vapour. The hose should be free from kinks, constrictions or U-bends where solvent could gather and block the exhaust line.

Using the mains cable supplied, connect two power inlets, one on the back and one on the side of the evaporator, to two separate mains power outlets.



Installing systems with inert gas purge

Evaporators with inert gas purge are supplied with a 2.5 m hose which has a 3/8” BSP female connector, for connection to a pressure regulated inert gas supply (for inert gas supply requirements, refer to: Specifications).

The evaporator must only be operated in a ventilated environment. Genevac strongly recommend installing evaporators with inert gas purge in a fume cupboard.

Warning: Risk of solvent ignition. Backpressure in the exhaust line can prevent the condenser draining. If more than one evaporator is installed, each one must be connected to a suitable laboratory fume extraction system by a separate exhaust hose.

Genevac recommend that evaporators, equipped with inert gas purge, are installed by an authorised Genevac representative.

Final checks

Before powering up, refer to the following over-view diagram and check all parts of the system are installed correctly.

Carry out a safety assessment before operating the evaporator. Make sure the exhaust hose takes solvent vapours away from personnel, and from the instrument, safely.

If personnel lack the training or experience to comprehend the hazards that can arise when using the equpiment, do not allow them to use it. Personnel without such training require thorough instruction. The instructions contained within the User Manual may form the basis of such training.

Troubleshooting

Audible and visual alerts

Audible	
Button acknowledge	Short beep
Illegal button press	Short double beep
Evaporator stopped	Three beeps when the system comes to rest. Repeats every minute until user intervenes (press button, turn SELECT control, open lid)
Shutdown errors	Repeated beeps until user intervenes (press button, turn SELECT control, open lid)

Visual	
Evaporator stopped	Condenser back-light flash: 3 x flashes – pause
Error encountered	Condenser back-light flash: 1 second on – 1 second off and error message appears on the display
Defrost heater failure	Section at the base of the condenser glass jar illuminates red (if this happens, contact Genevac service for advice)

Faults and errors

In the unlikely event that an error occurs that could affect the physical condition of the evaporator or its ability to safeguard the integrity of the samples (a critical error) the system will stop automatically. A ***fault*** number and a description of the problem appears on the LCD screen.

If a non-critical error occurs, the system continues to operate (possibly with reduced efficiency), for certain errors a description of the problem is shown and the condenser backlight flashes to alert the user. An example of a non-critical error could be the failure of an IR lamp, the evaporator would continue to operate without compromising the safety of samples, but the evaporation rate would slow down.

The EZ-2 will not allow an evaporation to start when a fault or error is displayed.

Rectifying faults or errors

A summary of faults and errors that may appear on the LCD screen are listed below. Additional details, including recommended actions, may also be shown on the LCD screen.

Error	Indication	Cause	Rectification
01 - 04	*Err No*	Lid sensor system failure	Contact Genevac Service
05	*Lid not locked*	Lid lock sensor indicates unlocked during evaporation	Do not attempt to open lid once the EZ-2 is started. Press the ***lid unlock button*** - open and reclose lid
06	*Lid not unlocked*	Lid lock sensor indicates locked when unlock solenoid is energised	Press the lid unlock button - open and reclose lid
07, 08	*Err No*	Motor fault	Contact Genevac Service
09, 10	*Err No*	Temperature sensor failure	Contact Genevac Service
11	*Chamber pressure out of range low*	Pressure sensor failure	Contact Genevac Service
12	*Set max temp out of range low*	System or sensor fault	Contact Genevac Service
13, 14, 15	*Err No*	Vibration sensing failure	Contact Genevac Service
16	*System test failed*	System checksum failure	Contact Genevac Service
17	*Software failed*	System checksum failure	Contact Genevac Service
18, 23, 24	*Datakey test failed*	Data key failure	Re-programme or try different USB storage device
19	*IR body temp*	IR sensor failure	Contact Genevac Service
20	*Err 20*	Vibration sensing failure	Contact Genevac Service
21	*Chamber heat fail*	Fail to heat to start temp	Contact Genevac Service
22	*Chamber cool fail*	Fail to cool to start temp	Contact Genevac Service
25, 26	*EEPROM error*	System failure	Contact Genevac Service
27	*Software write failed*	System failure	Contact Genevac Service
28	*Vacuum loss*	Pressure 150 mbar above control pressure	Contact Genevac Service
30	*Err 30*	Purge signal	Contact Genevac Service
31	*ADC data fail*	System failure	Contact Genevac Service
37	*Flow pressure low*	IGP senses below normal pressure when disconnected	Contact Genevac Service
41	*Err 41*	Defrost valve failure	Contact Genevac Service
42	*Err 42*	IGP fail during operation	Contact Genevac Service
43	*Err 43*	No data in EEPORM	Contact Genevac Service
44	*Supply voltage*	Refer to specification	Fault is external to evaporator
45, 46	*Lid unlocked / fault*	Sensor indicates unlocked when lid should be locked.	Press the ***lid unlock button*** - open and reclose lid. Check if ***latch release*** screw has been adjusted, refer to: ***Opening lid without power***
48	*Out of balance*	Samples imbalanced at start up or due to uneven evaporation	Balance sample holders within 10 g

Error	Indication	Cause	Rectification
49	*No vacuum*	Fail to reach 200 mbar in 15 mins	Check vacuum pump is operating. Check the condenser jar is correctly fitted. Check the lid seal (restart and push lid down manually to assist sealing)
50	*ADC gain / offset*	Unexpected calibration values	Contact Genevac Service
51	*Defrost failure*	Condenser fails to reach -20°C	Contact Genevac Service
52	*Gas temp low*	Temp sensor failure	Contact Genevac Service
53	*Chamber temp out of range high*	Temp sensor failure	Contact Genevac Service
54	*Rotor temp out of range high*	Temp sensor failure	Contact Genevac Service
55	*Chamber pressure out of range high*	Connection / sensor failure	Contact Genevac Service
56	*Set max temp out of range high*	System failure	Contact Genevac Service
57	*IR body temp out of range high*	Temperature sensor failure	Contact Genevac Service
58	*Condenser gas temp out of range high*	Temperature sensor failure	Contact Genevac Service
59	*Lid closed sensor stuck*	Lid unlocked but not opened multiple times	Clear the error, always open lid after unlock button is pressed
60	*Gas supply high*	Inert gas supply pressure too high (IGP systems only)	Reset inert gas supply pressure regulator. Refer to Technical Data: Specifications
61	*Gas supply low*	Inert gas supply pressure too low (IGP systems only)	Check gas supply, reset inert gas supply pressure regulator. Refer to Technical Data: Specifications
62	*HeatFlow failed to arm, some stages may run to time*	Sample volume too small, sample temperature too low, or combination of both	Increase sample volumes or adjust ***SET MAX TEMP °C*** control. Alternatively allow EZ-2 to run to time
63, 64	*Lid temp out of range*	Temperature sensor failure	Contact Genevac Service
65 - 70	*Inert purge fault*	Inert gas purge system failure	Check inert gas supply. In the event of failure to vent due to inert gas problems, assess the risk before turning the system off. Contact Genevac Service
71	*Vacuum integrity fault*	Fails to pull vacuum at start of pump down	Contact Genevac Service
72	*Incompatible software version*	Incorrect software inadvertently loaded	Contact Genevac Service
80	*USB error*	Detected by CPU	Contact Genevac Service
81, 83, 84	*EEPROM fail*	Software fails to respond / read / wright	Contact Genevac Service
82	*IR sensor fail*	No response from IR sensor	Contact Genevac Service
85	*ADC overrun*	Data conversion failure	Contact Genevac Service

If the recommended actions fail to resolve a problem, contact your local Genevac representative for assistance.

Clearing faults and errors

Once the problem is resolved, press and hold the ***STOP*** button for five seconds. Cancellation of the error is confirmed by a beep. If the display then shows another error, hold down the ***STOP*** button; each error will clear, one after another.

IR lamp failure

Errors that cause the IR lamp to switch off (including the failure of the IR lamp itself) will also cause the end of run detection system to deactivate. If this happens, the evaporation continues for a predetermined time, and then stops automatically.

Opening lid without power

In the event of power failure, the vacuum system vents automatically, the rotor may take up to two minutes to stop spinning.

Once the rotor is stationary and the vacuum system is at atmospheric pressure, inset a 2.5 mm Allen key into the hole in the lid and engage it with the latch release screw.

Latch release screw

Turn the latch release screw clockwise (approximately 15 turns) until resistance is felt. Remove the Allen key and open the lid.

Using the Allen key, turn the latch release screw fully counter-clockwise before closing the lid.

Fuses

Mains live and neutral fuses are located on the evaporator service panel and on the rear panel. Isolate the evaporator from the mains power supply by disconnecting the mains power cables before removing fuses.

To remove a fuse, turn the holder a ¼ turn counter-clockwise using a flat blade screwdriver.

Mains inlet / outlet fuses

Fuse types vary according to regional mains power supply.

Mains power	location	Fuse rating	Dimensions	Manufacturer's description	Part number
230 V 50 Hz	Side	6.3 A	1¼" x ¼"	SIBA 70-065-65-6.3	04-3587
230 V 50 Hz	Rear	6.3 A	1¼" x ¼"	SIBA 70-065-65-6.3	04-3587
120 V 60 Hz	Side	10 A	1¼" x ¼"	SIBA 70-065-65-10	04-3588
120 V 60 Hz	Rear	10 A	1¼" x ¼"	SIBA 70-065-65-10	04-3588
100 V 60 Hz	Side	16 A	1¼" x ¼"	SIBA 70-065-65-1.6	04-3766
100 V 60 Hz	Rear	10 A	1¼" x ¼"	SIBA 70-065-65-10	04-3588
100 V 50 Hz	Side	16 A	1¼" x ¼"	SIBA 70-065-65-16	04-3766
100 V 50 Hz	Rear	10 A	1¼" x ¼"	SIBA 70-065-65-10	04-3588

Caution: Fuses should only be replaced by suitably trained personnel. If a fuse blows repeatedly, contact Genevac service for assistance.

Other troubleshooting

Symptom	Cause	Rectification
Display not illuminated	Power supply failure	Check the power supply is connected and switched on
	Fuse failure	See ***Fuses***
	System in standby mode	Press the ***START*** button
Evaporator does not start	Waiting to heat or waiting to cool	The evaporation will start when the system is ready
	Error has occurred	Check the display for information messages and refer to ***fault or error rectification*** tables
Rotor does not spin	Drive belt failure	Contact Genevac service
	Drive motor fuse failure	Contact Genevac service
No vacuum	Pump fuse failure	Contact Genevac service
	Pump failure	Contact Genevac service
Vacuum begins to pull down, but fails to get below 900 mbar	Lid not fully closed	Stop evaporator and check for obstructions
	Lid not sealing	Stop evaporator, check fit and condition of lid seal, check for obstructions
	Condenser jar not sealing	Check the condenser jar and condition of the jar seal
Vacuum pulls down to 500 mbar then rate slows dramatically	Method includes a DriPure stage	The system is operating correctly
Vacuum pulls below 900 mbar but takes longer than usual, or fails to achieve expected level of vacuum	Condenser jar seal damaged	Contact Genevac service
	Lamp glass cracked	Stop evaporator, inspect / replace lamp glass assembly. Refer to ***Maintenance*** section
	Condenser full of volatile solvent	Drain condenser after every use
	Condenser fuse failed	Contact Genevac service
	Lamp glass seal damaged	Stop evaporator, inspect / replace lamp glass assembly. Refer to ***Maintenance*** section
Vacuum stops pulling down at 215 mbar, 115 mbar and / or 30 mbar.	System waiting for condenser to cool	The system is operating correctly. This optimises solvent recovery and extends pump life
Solvent boils in condenser	No problem	The system is operating correctly
Lid will not open	No power	Reconnect power and try again
	Lock jammed	Refer to: ***Opening the lid without power***
	Lid seal stuck to glass due to excessive solvent on the lid seal.	Allow the solvent to evaporate before further use. Clean seal and lid
Lid glass feels loose	The lid glass is designed to float	The system is operating correctly

Symptom	Cause	Rectification
Method takes longer than expected to complete	Lamp failure	Check lamp is illuminated (by looking through lid glass). Replace lamp if necessary.
	Vacuum leak	Perform a ***System test***
	Incorrect method selected	Stop the evaporator, reselect an appropriate method and restart
	Low control temperature set	Reset the correct sample temperature for the compound
	IR Lamp lens contaminated	Stop the evaporator. Inspect, clean, replace the lamp glass. Refer to ***Maintenance*** section
	IR sensor contaminated	Clean IR sensor lens. Refer to ***Maintenance*** section
	Condenser fuse failure	Contact Genevac service
	Incorrect sample holder for sample format	Contact Genevac applications
Samples not dry after automatic stop	Excessive sample volume variation	Top up low volume samples to similar level. Alternatively adjust method parameters to increase ***Time to final stage***
	Final stage too short	Adjust method parameter to increase final stage time
Samples dry but not dry enough	Various factors can cause this	Contact Genevac applications for advice
Poor solvent recovery or excessive quantity of solvent in exhaust catch pot	Incorrect method selected	Check that method selected is most appropriate
	Condenser full	Check condenser is drained after every use
	Vacuum leak	Perform ***System test***
	Condenser fuse failed	Contact Genevac service
	Volatile solvent	Contact your local Genevac agent to request special methods
Condenser does not drain	Waset solvent drain hose blocked	Check / replace waste solvent drain pipe
	Waste solvent container full	Empty waste solvent container
	Drain valve fails to open	Initiate manual defrost / drain cycle. Contact Genevac Service if problem persists
Body of system gets hot	This is normal	The system is operating correctly
Excessive vibration	High out of balance	Stop evaporator, rebalance samples
Condensation inside chamber	Incorrect method selected	Stop the evaporator. Select the most appropriate method and restart
Cannot unlock and open lid (lid LED not lit)	Safety count-down still active	Wait until count-down reaches zero then try again
	Lid unlock button pressed too often in 5 minutes	Wait for system to re-enable lid lock (LED will re light)

If the recommended actions fail to resolve a problem, contact Genevac your local Genevac representative for assistance.

Options

Standard equipment

The EZ-2 Elite features the following equipment as standard:

- ***Dri-Pure***® eliminates sample bumping and prevents associated problems of sample loss and cross contamination
- ***Auto defrost and drain*** for automated evaporation of solvent mixtures including HPLC fractions
- ***Scroll pump*** super high vacuum pump for exceptionally demanding applications. This pump offers oil free, low maintenance operation.

HCl resistance

HCl resistant systems are built specifically to resist attack from HCl, with all vulnerable parts being manufactured from inert material.

Inert gas purge

The use of inert gas purge is mandatory for the safe evaporation of diethyl ether, pentane and other low auto-ignition point solvents. In addition, samples can be protected from reaction with elements in the air at the end of the evaporation process.
Infinity Trolley is a modular trolley system. The lower shelf can be pulled out to provide access to for maintenance and any number of units can be bolted together, side by side.

Infinity trolley

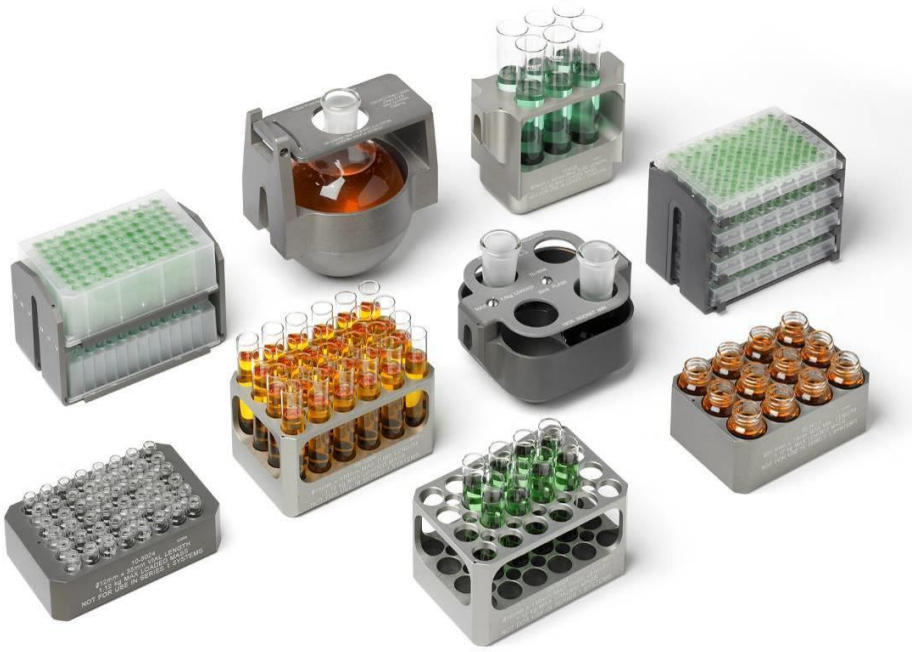
Infinity Trolley is a modular trolley system. The lower shelf can be pulled out to provide access to for maintenance and any number of units can be bolted together, side by side.

Sample Holders

A wide range of swings and sample holders is available to cover plate, tube, vial and flask formats, as well as the revolutionary Genevac ***SampleGenie™*** system. The illustration shows just a few of the sample holders available

Sample holders are manufactured in solid aluminium and are anodised to improve heat absorption. The contact area is maximised to provide good physical support, optimum heat transfer and even heat distribution for drying loads.

For further details of sample holders, contact your local Genevac representative to request a ***Genevac Accessories Brochure*** or visit the Genevac web site at www.genevac.com.



Technical Data

Specifications

Evaporator	
Max rotor speed	2150 rpm
Max load per swing	1.5 kg
Max operational imbalance	40 g
Dimensions (w x d x h)	570 x 645 x 700 mm
Approx weight (varies with build options)	80 kg

Vacuum pump (remote)	
Type	Oil free scroll
Ultimate system vacuum	0.5 mbar
Dimensions (w x d x h)	432 x 282 x 302 mm
Weight	26.2 kg
Vacuum hose / control cable length	3 m

Condenser (integral)	
Type	Single stage vapour compression
Refrigerant	R404a
Lowest possible temperature	-50°C
Nominal operating temperature	-35°C

Storage / transportation environment	
Ambient temperature	0°C to 40°C (-10°C permissible during transportation)
Relative humidity	10% to 80% non-condensing
Store upright	

Operational environment	
Ambient temperature	15°C to 30°C
Relative humidity	10% to 80% non-condensing
Altitude	Sea level to 1600 m
Ventilation air-gap	50 mm
Ingress protection trating	IP30

The evaporator is designed for use in a pollution degree 2 environment (normally only non conductive pollution occurs).

Inert gas supply requirments (IGP option)	
Max pressure	2 bar g (3 bar absolute)
Min pressure	1.5 bar g (2.5 bar absolute)
Flow rate (nominal)	50 litres / min @ STP
Max consumption - purge cycle	250 litres
Max consumption rate - blanket	110 litres/hour
Hose length	2.5 m
Connector type	$^{3}/_{8}$" BSP female

Emissions
Typical noise level is 69 dB (A) at one metre from the evaporator during normal operation.

For the purpose of air conditioning requirement calculations, all power consumed by the system is dissipated as heat.

PTFE hose (6 mm ID, 8 mm OD) is supplied to connect the evaporator to a laboratory fume extraction system.

Electrical Supply	Peak running power VA (W)	Peak current (A) @ unit voltage	Supply
100 V 50 Hz	1200	12	Side (1)
	510	5.1	Rear (2)
100 V 60 Hz	1200	12	Side (1)
	480	4.8	Rear (2)
120 V 60 Hz	1800	15 (typically 10)	Side (1)
	600	5	Rear (2)
230 V 50 Hz	1610	7	Side (1)
	580	2.5	Rear (2)

The system must be connected to mains power supply outlets by two separate mains power cables. Power cables supplied are 2 m in length and appropriate to the region to which the unit is delivered.

Note: To prevent nuisance tripping, the mains power supplies to the evaporator should be fitted with suitably rated type “D” (or equivalent) mains circuit breakers.

EC Declaration of Conformity

SP SCIENTIFIC
Making Time for Science

EC Declaration of Conformity: EZ-2 Series Evaporators

Manufacturer's Name: Genevac Ltd

Manufacturer's Address: Farthing Road
Ipswich
Suffolk
IP1 5AP
UK

Type of Equipment: Laboratory Equipment

This is to certify that the following product(s):

- **EZ-2 Standard**
- **EZ-2 Envi**
- **EZ-2 Plus**
- **EZ-2 Elite**

(all variants, including HCl and inert gas purge options)

From serial Number : 3100 onwards

Conform to the Essential Health and Safety requirements of European Directives:

- Machinery Directive (2006/42/EC)
- EMC Directive (2004/108/EC) and
- Low Voltage Directive (2006/95/EC)
- RoHS2 Directive (2011-65/EU)

A technical construction file for this product is held at the above address

Conformity is demonstrated by compliance to the following standards:

- BS EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use. General requirements.
- BS EN 60204-1:2006 + A1:2009 Safety of machinery. Electrical equipment of machines. General requirements.
- BS EN 61326-1:2006 Electrical equipment for measurement, control and laboratory use. EMC requirements
- BS EN 12100:2010 Safety of machinery. General principles for design. Risk assessment and risk reduction.
- BS EN 378-2:2008 + A1:2009 Refrigerating systems and heat pumps. Safety and environmental requirements. Design, construction, testing, marking and documentation.

CE

Signed: 

Name: G Broadbent

Position: Research and Development Manager

Date: 18th July 2014

Being the person appointed by Genevac Ltd to sign on their behalf

Warranty statement

This product is guaranteed for period of 12 months from the date of delivery to site. In the unlikely event of any defect arising due to faulty materials or construction resulting in system failure, the unit will be repaired free of charge. This includes all labour and component costs incurred.

This warranty is subject to the following provisions:

- The system must be sited, installed and operated in accordance with instructions in this User Manual.
- Exhaust vapours must be ducted away from the system as described in the ***Setting up*** instructions within this user manual.
- The system may only be used for the purpose for which it was sold and in accordance with the Genevac List of Approved Solvents.
- Preventive maintenance and cleaning must be carried out as detailed in the ***Maintenance*** section of this user manual.
- Power leads supplied with a system are for use with that system only.
- If items are replaced by the owner, only Genevac approved parts may be used.
- In the event of a vacuum pump failure, the pump may be exchanged for a refurbished unit. The owner is responsible for the exchange and return of the failed unit.

Failure to adhere to the above will invalidate the warranty and result in a charge being made for the cost of repairs. This warranty does not cover accidental damage, modification, misuse or inappropriate repair by untrained personnel, consumable items are covered against manufacturing defects only.

Consumable items

Consumable items include: lid seal, condenser jar seals and thread inserts, IR lamp bulb, glass and seals.

Returning equipment to Genevac

The equipment is supplied in reusable packaging. Where possible, this should be retained for reuse in the unlikely event that system needs to be returned for repair. If the packaging is not retained, a charge will be made for replacement packaging and any shipping costs incurred.

Genevac will not accept any delivery of equipment which is not accompanied by appropriately completed Safety Declaration paperwork. This applies to all equipment and / or parts.

To obtain the necessary Safety Declaration paperwork, or for details of Returns Authorisation procedures, contact your local Genevac representative or Genevac Service Department. Contact details are shown on the back cover of this user manual.

Patents

Genevac products are protected by the following patents or patent applications:

1297874 CH
699 18 734.6-08
2362590
1297873 CH
699 18 733.8-08
2363745
6,878,342
7,252,803
1556149
1556149
1556149 FR
2396575
4465277
7,503,997
03769683.8 (pending)
2395772
7461465
7,498,175
6,682,631
1196757 CH
600 07 636.9-08
2351683
7,179,651
1153278 FR

Amendment control

Issue	Reason for change	Date issued
2-7	Infinity trolley option added. Specifications updated. Allen key size for emergency lid open: 2.5 mm (correction). Electrical earthing warning for systems with multiple power leads added.	29-May-13
2-8	Emergency shutdown instruction added. Reference to Nitric acid removed under heading “HCl resistance”.	01-Jul-13
2-9	Pause time limit removed to reflect software change. 5 mm Allen key no longer supplied.	15-Jul-13
2-10	Acceptable solvents statement amended. Specifications amended: ultimate system vacuum, vacuum pump weight, IGP gas consumption, store upright, Electrical. US contact address updated.	05-Aug-13
2-11	Atmospheric pressure sampling for IGP methods described. Time to final stage clarification.	22-Oct-13
2-12	nXDS6i replaces XDS5. Sample holders / swings image updated. IGP instructions revised. Illumintaed power switch removed. Limitations for IGP and HCl added to acceptable solvents. IR lamp glass assy part number replaces IR lamp glass part number. Original instructions statement added. Condenser jar replaces collection jar and SpeedTrap jar. Sample holder colour variation noted. EZ Declaration of Conformity updated. Drip-plate replaces catch-plate. Type “D” or equivalent replaced type”D”.	09-Jan-14
2-13	Ingress protection rating specification added. Blue filter image changed from EZ-2 to EZ-2 Elite. Weight specification increased. LCD illustrations added. File transfer function and 45 mbar control stage for Systems Test added for software V1.01 onwards. Timer arrow illustrated. HCl lamp assy added, seals upgrade for non-HCl lamp assy removed.	03-Mar-14
2-14	HTP orientation instruction added.	09-Mar-14
2-15	IGP disconnection instructions clarified. HTP for use with microtitre plates only instruction added.	26-Mar-14
2-16	Statement: “powers up in stand-by mode” removed. System Test information moved from Advanced operation to Maintenance. Exhaust hose dimensions amended.	06-May-14
2-17	Error 72 to 85 added to Troubleshooting guide.	09-May-14
3-1	Condenser specification revised. Acceptable solvents revised. Power specification correction.	04-Jul-14
3-2	Software upgrade method for non-USB systems added. Boot-up description updated to reflect software changes. System Information instructions added. Overview replaces Introduction. DoC updated.	21-Jul-14
3-3	Specification for operating environment humidity revised.	10-Aug-14

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Useful information

Read these operating instructions before using the Genevac EZ-2 Elite evaporator and keep them near the instrument for easy reference. Your attention is drawn in particular to the Safety section.

These instructions are correct at time of going to press and may be subject to change without notice. Some of the features and software functions described within this user manual may not apply to equipment manufactured before this manual's publication date, this includes systems that have been upgraded.

If you need to contact Genevac for assistance, use either the telephone or fax Hotlines shown. Please have the instrument serial number at hand. Alternatively, email or visit our web site.

The evaporator should not be discarded in your regular disposal stream. Contact your Distributor or Genevac for proper disposal instructions.

Within the EU, it is Genevac's responsibility under the WEEE directive to provide for the recycling of Genevac products.