The miVac Modular Concentrator Series

User Manual

Part number 04-5057 Issue 2-6 September 2012

Contents

Introduction

miVac is a modular range of centrifugal concentrators that can be combined in different ways to provide great flexibility for a variety of applications. Concentrators feature built in methods for alcohol and water, and come in two different sizes, an optional SpeedTrap™ can dramatically improve concentration performance and a pressure controller can be added to enhance the system's flexibility still further. A choice of oil free vacuum pump completes the system.

Optional pressure controller, installed with system

If required, components from the miVac range may be used with similar equipment from other manufacturers. All equipment is designed for ease of use, offers very high performance and takes up the smallest possible amount of bench space in the laboratory.

Set-up is simple with just one set and select control and a minimum number of push button controls. When the system is operating, a large LCD screen shows the sample temperature and elapsed time.

This manual will explain the set-up process and show you how to operate the system. It will guide you through the maintenance requirements and provide information to facilitate the most efficient procedure to protect the integrity of your samples and ensure optimum performance from the system at all times.

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.

The following symbols may be found on the equipment:

This symbol means surfaces may be hot and could cause burns.

This symbol means there is risk of hand entrapment.

Refer to the relevant part of the User Manual for additional information.

These Two symbols combined, indicate hazards that can lead to serious material damage or potential serious injury. Refer to the relevant part of the User Manual.

Precautions

Observe the following safety precautions when using the miVac system:

- Only use rotors 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 system.

Caution: Incorrect loading may result in damage to samples and to the miVac 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 miVac system, do not allow them to use it; personnel without such training require thorough instruction and the instructions contained within this User Manual may form the basis of such training.

Combustible solvents

Warning: Risk of vapour ignition. Only operate the miVac 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 distributor.

Electrical earthing

Warning: Risk of electric shock. This equipment must be earthed, the miVac system is a safety class 1 product according to IEC classification. It must never be used with any interruption to the safety earth conductor. It is an installation category II product and is intended to operate from a normal single-phase supply.

Strong acids

Caution: The miVac concentrator is unsuitable for use with strong acids. Do not attempt to evaporate strong acids such as HCl, TFA or HBr, at any concentrations.

Limitations of use

Caution: Rotary-vane oil-filled vacuum pumps are not recommended for use with miVac systems. Vapours from the system may cause damage to the pump.

Notwithstanding the above advice, if a rotary vane oil pump is used, the pump should be run with the gas ballast set to position 1; this will help to prevent damage to the pump. Oil pumps should then be run for one hour after the end of the concentration process (with ballast still engaged) to ensure that there is no condensed vapour in the pump. Ultimately, it is the responsibility of the user to check with the pump manufacturer as to how the pump should be operated.

Options

The modular concentrator, SpeedTrap and pump units can be installed in multiple combinations to form the basis of the evaporation system.

Duo concentrator

The ***Duo concentrator*** is designed to accept a two swing position microplate holder, or a range of disc rotors for tubes or vials.

Quattro concentrator

The larger ***Quattro concentrator*** can accommodate a four swing position rotor, larger capacity disc rotors and can also accept Duo rotors.

SpeedTrap™

SpeedTrap (condenser) can improve the performance of any miVac system by removing large volumes of vapour and condensing them to liquid. The effect is a dramatic improvement in the system's ability to maintain vacuum and is reflected in reduced concentration times.

Duo / Quattro pump

A choice of either ***Duo*** (10 mbar) or ***Quattro*** (2 mbar) diaphragm pump can be selected to complement either Duo or Quattro concentrator. Both pumps offer oil free, low maintenance operation.

Super high vacuum pump

For exceptionally demanding applications, a 0.15 mbar super high vacuum (scroll) pump can be selected. This pump offers oil free, low maintenance operation.

Pressure controller

For enhanced performance, a pressure controller can be added to any modular miVac system. The device can automatically sense the control pressure for any solvent, or can provide vacuum ramping to reduce the risk of bumping.

Lyo option

A Lyo Option can be added to any modular miVac system that features a condenser with switchable defrost mode (manufactured from March 2011) and must be installed in conjunction with a high vacuum pump. The miVac Lyo Option consists of:

- vacuum isolation valve and mounting bracket
- cascade condenser pot
- insulated vial holders
- three rubber valves.

Additional accessories can be ordered individually.

DNA concentrator

The ***DNA*** concentrator offers an alternative to modular units, combining a Duo concentrator and Duo pump into an integrated unit. The DNA is capable of removing small volumes of water and organic solvents, the unit is extremely compact and will easily fit on a bench top. There is no option to add a SpeedTrap.

Rotors

A full range of rotors is available for the miVac range, including:

- open sample holders
- solid aluminium JetRotors
- swing rotors for microtitre plates.

Your local miVac distributor will be happy to offer advice or information on the full range of miVac rotors available.

Vapour trap

For neutralising ammonia or acid vapours on systems with Duo or Quattro pumps, the vapour trap replaces the pump exhaust catch-pot and comes complete with all connectors required to fit it to the pump.

Order using Genevac part number: VAP-TRAP0-100

Note: Requires neutralising solution, see: ***Accessories***.

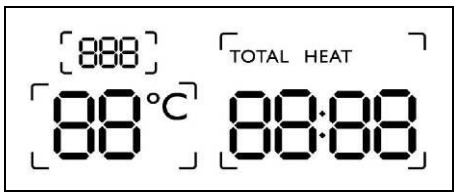
Accessories

Part number	*Description*
STJ-10000-000	1 litre jar for miVac SpeedTrap
MCK-00000-Y00	System connection kit for connection of pump and / or SpeedTrap trap to concentrator, complete with a 2.5 m length of vacuum hose, hose cutter, power lead to control pump and catch-pot for pump
RTR-FRCTN-001	Spindle friction washer (prevents rotor slippage during spin-up / spin-down)
04-4783	Vacuum hose (specify length when ordering)
04-5016	Exhaust hose (specify length when ordering)
04-6095	Clip for vacuum hose
VAP-TRAP0-100	Vapour trap (requires neutralising solution)
NH3-REF00-100	Neutralising solution for amonia, 4 x 500 ml
ACD-REF00-100	Neutralising solution for acid, 4 x 500 ml

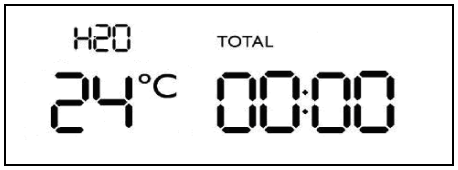
Basic Operation

Power up

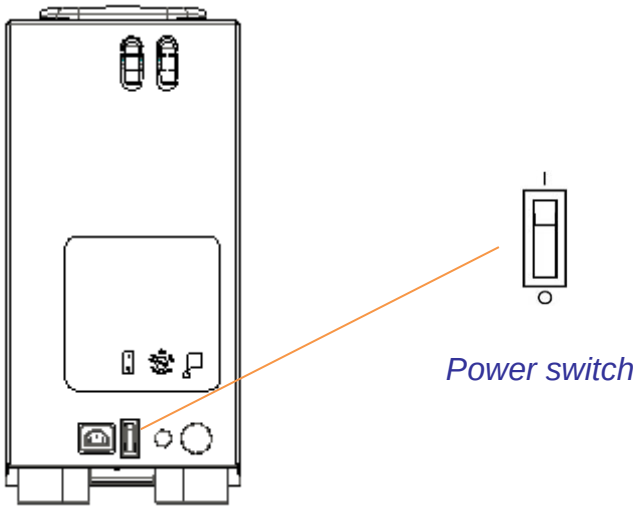
The Duo, DNA or Quattro concentrator, powers up as soon as it is connected to mains power. All segments of the LCD screen temporarily switch on and illuminate to test they are functioning correctly.



When the display reverts to showing the current settings, the system is ready to be used.



There is a power switch on the back of the SpeedTrap, which allows it to be switched off while it remains connected to mains power.



The vacuum pump remains in standby mode until the system is started, refer to: ***Starting the concentrator***.

Opening the lid

The concentrator lid is automatically locked when the rotor spins and only unlocks when it is safe to open. To open, manually lift the front edge of the lid.

Warning: Risk of hand entrapment. Secure the lid in the upright position before placing hands near the concentrator.

Standby mode

When the system is idle (powered-up but not operating) press the ***STOP*** ■ button to enter ***standby mode***.

Press any button to restart the system.

Controls

On the front panel there are four push buttons, a rotary ***SELECT*** control and an LCD screen.

1. ***MANUAL:*** Press once to start the system in ***manual mode***, the concentrator emits a single beep, starts and continues to operate until the ***STOP*** button is pressed. Whilst operating in this mode the respective LED lights up and a timer counts up to show the total time accumulated.

2. ***PRE-HEAT:*** Press once to pre-heat the chamber to the control temperature, ***PRE-HEAT*** is disabled when either the ***MANUAL*** or ***AUTO*** button is pressed. Alternatively, press and hold for five seconds to latch-on chamber heater continually.

3. ***AUTO:*** Press once to start the system in ***auto mode***, the concentrator emits a single beep, starts and continues to operate until the ***TOTAL*** time set has elapsed. Whilst operating in this mode, the respective LED lights up and the timer counts down to show the time remaining.

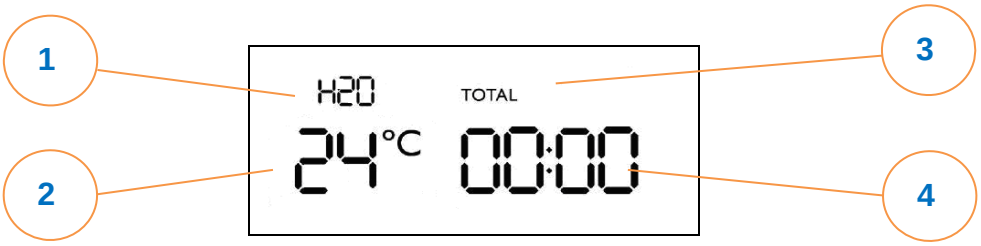
4. ***STOP:*** Press once to stop the system, the concentrator emits a single beep and stops. The ***STOP*** button can be pressed at any time and the system will shutdown safely. If the ***STOP*** button is pressed when the system is idle, it will enter standby mode. Press any button to bring the system out of standby.

5. ***SELECT:*** Turn the control to select a parameter (frame it with brackets) then press it to select (brackets flash to indicate adjustment mode). Turn the control to increment the setting up or down and press again to enter the new value. The display reverts back to normal mode after 30 seconds.

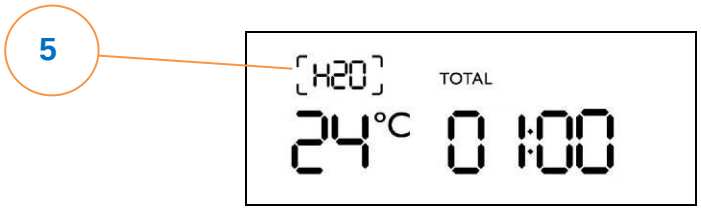
6. ***Display:*** LCD screen with backlight.

LCD screen

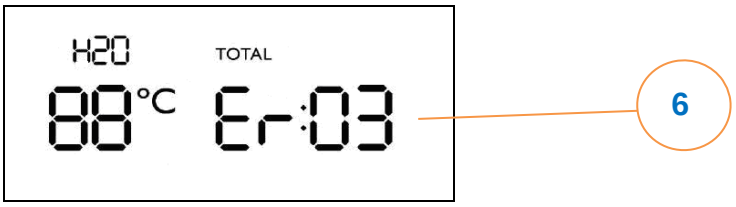
The LCD screen provides numeric information for setting control parameters and monitoring evaporation progress.



1. ***Method indicator:*** ***H20*** (water) ***-OH*** (alcohol) or ***---*** (full vacuum)
2. ***Temperature:*** Chamber temperature
3. ***Timing mode:*** ***TOTAL*** time from start, or ***HEAT*** time
4. ***Timer:*** Time elapsed (in ***manual mode***) or time remaining (in ***auto mode***)



5. ***Adjustment mode:*** Brackets appear around parameter to indicate it can be adjusted using the ***SELECT*** control



6. ***Error:*** The LCD screen also advises of any problems that occur during operation or with the settings being entered.

Getting started

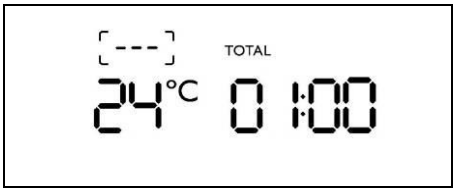
The following is a quick reference guide only. Detailed descriptions of features and operating instructions are provided later on in this user manual.

1. Switch on the power at the mains supply.
2. If required, use the ***SELECT*** control to set the pre-heat temperature and press ***PRE-HEAT***.
3. Open the lid. (for Quattro concentrator make sure the latch engages).
4. Fit the rotor by sliding it on to the shaft.
5. Load the rotor with samples, make sure the rotor is evenly balanced.
6. Close the lid (for Quattro concentrator lift the lid to disengage the latch).
7. Using the ***SELECT*** control:
   - Set the chamber temperature
   - Set the method type
   - Set the total run time
   - Set the heat time.

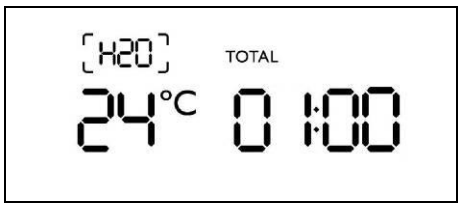
   Note: if the above parameters are not set, the system will use the last settings entered.
8. Press the ***MANUAL*** or ***AUTO*** button to start the concentrator.

Selecting a method

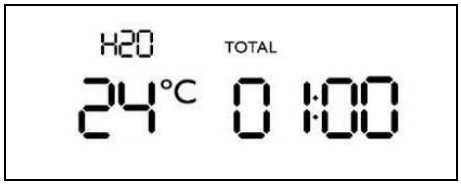
To select the required method, turn the ***SELECT*** control until brackets appear around the method indicator.



Press the ***SELECT*** control, the brackets begin to flash to indicate the parameter may be adjusted. Turn the control until the required method is shown, then press to select.



The LCD display shows the selected method.



Starting the concentrator

The concentrator can be started in either ***manual mode*** or ***auto mode***.

Select the required method and set the temperature before starting the concentrator.

Manual mode

To start in ***manual mode***, press the ***MANUAL*** ► button. The concentrator emits a single beep to confirm acceptance of the command and the rotor begins to spin (if the lid is not closed, a double beep sounds and the concentrator will not start).

The LED adjacent to the ***MANUAL*** ► button lights up to indicate the system is operating in manual mode. Once a safe rotor speed is reached, the system begins to apply vacuum and the timer starts to count up, indicating the time accumulated. The concentrator continues until the ***STOP*** ■ button is pressed.

Auto mode

To start in auto mode, press the ***AUTO*** ► button. The concentrator emits a single beep to confirm acceptance of the command and the rotor begins to spin (if the lid is not closed, a double beep sounds and the concentrator will not start).

The LED adjacent to the ***AUTO*** ► button lights up to show the system is operating in auto mode. Once a safe rotor speed is reached, the system begins to apply vacuum and the timer starts to count down from the set time, indicating the time remaining. The concentrator stops when the timer reaches zero or if the ***STOP*** ■ button is pressed.

Evaporation in progress

While the evaporation is in progress, the LCD screen shows the elapsed time when operating in manual mode, or the time remaining when operating in auto mode. When the time displayed is greater than one hour, it is shown in hours and minutes (HH:MM) when the time displayed is less than one hour, it is shown in minutes and seconds (MM:SS).

Stopping the concentrator

To stop the concentrator, press the ***STOP*** ■ button, the concentrator emits a single beep to acknowledge acceptance of the command. The ***STOP*** ■ button can be pressed at any time, the system will always stop safely.

When operating in auto mode, the concentrator stops automatically when the timer reaches zero. The ***STOP*** ■ button can also be used to stop the system when it is operating in ***auto mode***.

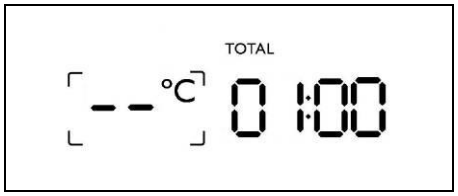
The auto or manual LED flashes to indicate the system is stopping, four longer beeps sound when the rotor is about to stop.

The time remains on the LCD screen until the lid is opened.

Advanced Operation

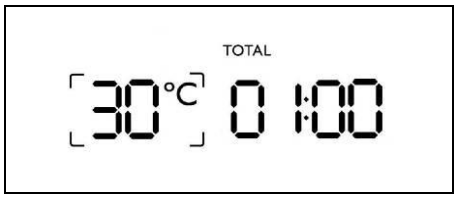
Method parameters can be adjusted at any time, including when the concentrator is operating. To adjust a method parameter:

Turn the ***SELECT*** control - brackets appear around different areas of the LCD display.



Press the ***SELECT*** control – the brackets begin to flash.

Turn the ***SELECT*** control – the selected value increments up or down.



Press the SELECT control – the new value is entered.

Note: If the ***SELECT*** control is not pressed, the displayed value is automatically entered after 30 seconds.

Method choice

There are three methods to choose from:

- ***H2O*** for water only
- ***-OH*** for alcohols and alcohol mixtures
- ***---*** for all other solvents.

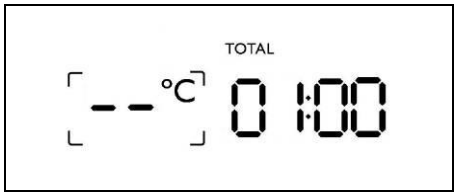
For further information, refer to ***Method Guide***.

Setting chamber temperature

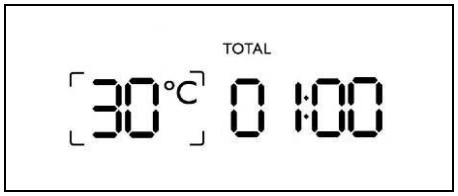
The chamber temperature can be controlled from 30°C to 80°C by 1°C increments. If the temperature is set below 30°C, the display shows **[--°C]** and the chamber heater is turned off.

Once the new value is selected, the display reverts back to showing the current chamber temperature (in the following example, the current chamber temperature is 24°C).

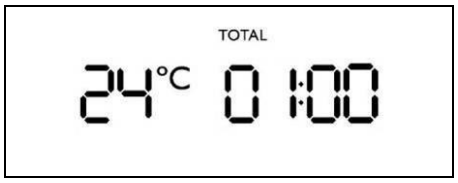
Select parameter.



Adjust the value to the required chamber temperature.



The LCD display reverts to showing the current chamber temperature.



Pre-heat

For solvents with a boiling point greater than 90°C, the chamber should be pre-heated to avoid solvent condensation in the evaporation chamber. Prolonged exposure to certain solvents in liquid form may cause damage to the concentrator lid coating.

To pre-heat the concentrator, press the ***PRE-HEAT*** button. An LED adjacent to the ***PRE-HEAT*** button lights up to show the chamber heater is active, and the chamber warms up to the currently set control temperature. For best results, place the empty rotor in the concentrator and leave the concentrator lid closed while pre-heating.

Caution: Bumping may occur if the sample temperature is too high when the concentrator is started. To avoid the possibility of damage to samples, do not pre-heat the concentrator with samples loaded.

Once the concentrator is started (by pressing either the ***MANUAL*** ► or ***AUTO*** ►start buttons) the chamber remains at the control temperature until the heat time elapses; the chamber heater then switches off.

Latching pre-heat

Pre-heat can be “latched” to stay on continually throughout the evaporation process and after the concentrator stops. This function allows the chamber to be kept warm, ready for the next use.

To latch on pre-heat, press and hold the ***PRE-HEAT*** button for five seconds. A confirmation beep sounds to acknowledge acceptance of the command, the chamber warms up to the control temperature and the heater continues to control the chamber at the control temperature throughout the evaporation process and after the system stops, even if the ***STOP*** ■ button is pressed.

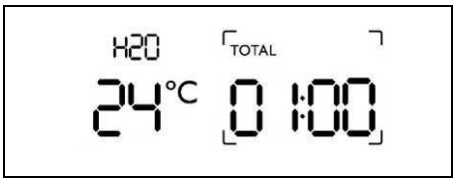
To cancel the function, press the ***PRE-HEAT*** button again.

Note: For older systems (software versions pre V1.09) the chamber preheats to 40°C, irrespective of the chamber control temperature.

Setting total time

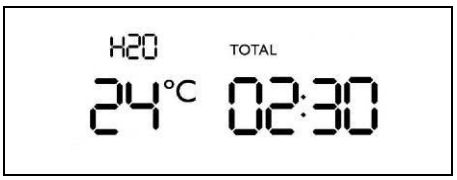
This feature allows the user to set the total time duration of the evaporation process when using ***auto mode***.

Select the timer.



Set the time required.

The LCD display counts down the time remaining.

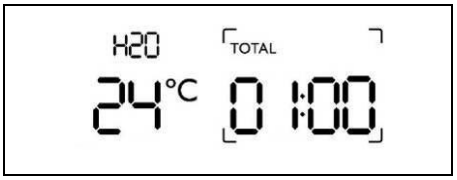


Setting heat time

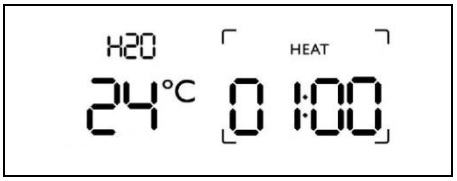
This feature controls the time duration that chamber heating is applied.

Note: The heat time:
- cannot be longer than the ***TOTAL*** time
- has no effect if ***PRE-HEAT*** is latched on.

Select the timer.



Select ***HEAT***.

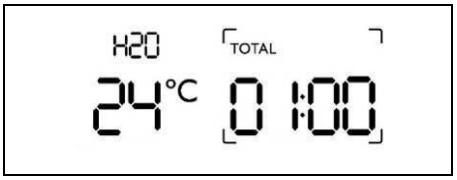


Set the heat time.

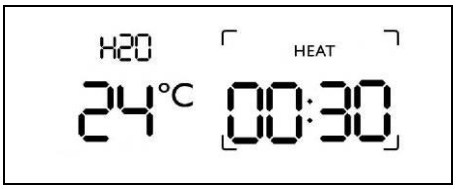
The LCD display counts down the heat time remaining.

Display mode

The LCD display is factory set to show ***TOTAL*** time.

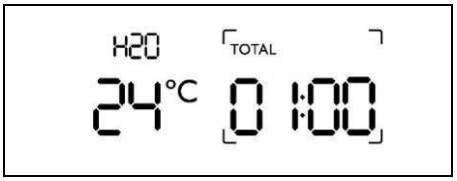


But it can be changed to show ***HEAT*** time when operating in ***auto mode***.



To change the display mode, hold down the ***SELECT*** control for five seconds; a single beep sounds to acknowledge acceptance of the command.

The display changes to indicate ***HEAT*** until the count down reaches zero, then reverts to showing the ***TOTAL*** time remaining.



To change the display mode back from ***HEAT*** time to ***TOTAL*** time, hold down the ***SELECT*** control again for five seconds.

SpeedTrap™

The miVac SpeedTrap offers:

- Unique frost free cold-trap
- Selectable automatic defrosting, all solvents (including water) collect as liquids
- Easy to empty collection jar
- Ideal for use on all concentrators (except freeze driers).

Caution: Refer to list of acceptable solvents before use.

Waste solvent

Waste solvents normally collect as liquid in the SpeedTrap jar, however ice may form under certain conditions. Refer to ***Collection Jar*** for further information.

Occasional sudden boiling within the jar is normal and solvent will re-condense.

Defrosting

The SpeedTrap has two possible modes of operation which can be selected using the switch located on the SpeedTrap splash-back panel:

periodic defrost:  or ***no defrost***: 

When operating in ***periodic defrost*** mode, defrosting of the condenser coil is fully automatic. The green LED on front of the SpeedTrap indicates when the defrost cycle is operating. After defrost, the SpeedTrap switches to chilling, then condensing.

LED	*Condition*
Fast flash	Defrosting
Slow flash	Chilling
Steady	Condensing

The system automatically defrosts for three minutes in every hour, without the need for any intervention.

When the switch is set to ***no defrost***, the SpeedTrap operates continually without periodic defrost.

The mode may be switched while the SpeedTrap is operating. If the mode is switched from ***periodic defrost*** to ***no defrost***, the SpeedTrap performs a short (three minute) defrost before continuing to operate in ***no defrost*** mode. If switched from ***no defrost*** to ***periodic defrost***, the SpeedTrap chills for 57 minutes before performing a short (three minute) defrost.

When choosing which mode of operation to select, consider the solvent being condensed; for further information, refer to ***Method Guide***.

Manual defrost

To manually initiate a defrost, momentarily press the switch down to the ***defrost*** position.

The defrost cycle takes approximately 30 minutes to complete, or can be cancelled manually by momentarily pressing the switch down again.

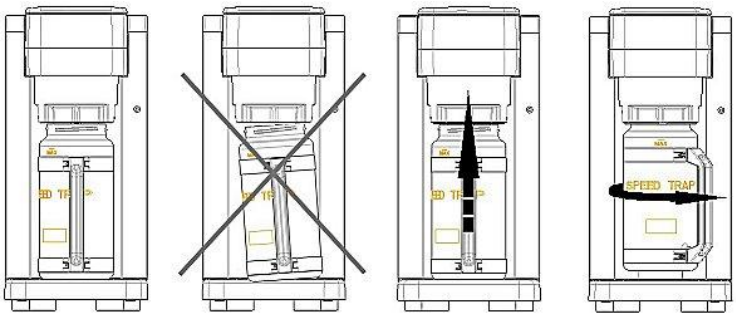
Note: SpeedTraps manufactured before February 2010, do not have switchable defrost modes. These units operate in periodic defrost mode only.

Collection jar

- Empty the collection jar after every use
- Do not empty the collection until the concentrator has stopped
- Take care when removing the collection jar, it may be heavy when full of solvent
- Do not allow the solvent level to fill above the ***max*** line, this may cause damage to the pump
- Inspect the collection jar for damage, cracks etc, before every use
- Empty the drip tray regularly to avoid the risk of splashing.

To remove the collection jar, grasp the handle to support the weight, and rotate the jar a quarter turn to the left.

To refit the jar, position it so that the handle is to the front, lift the jar and rotate a quarter turn to the right; tighten the jar until there is light resistance.



Waste solvents normally collect as liquid in the SpeedTrap jar, however ice may form under certain conditions. If this happens, allow it to thaw naturally; if necessary, add cold water to the jar to accelerate the thawing process.

Caution: Do not use implements to break the ice in the SpeedTrap jar as this may damage the jar.

Loading Samples

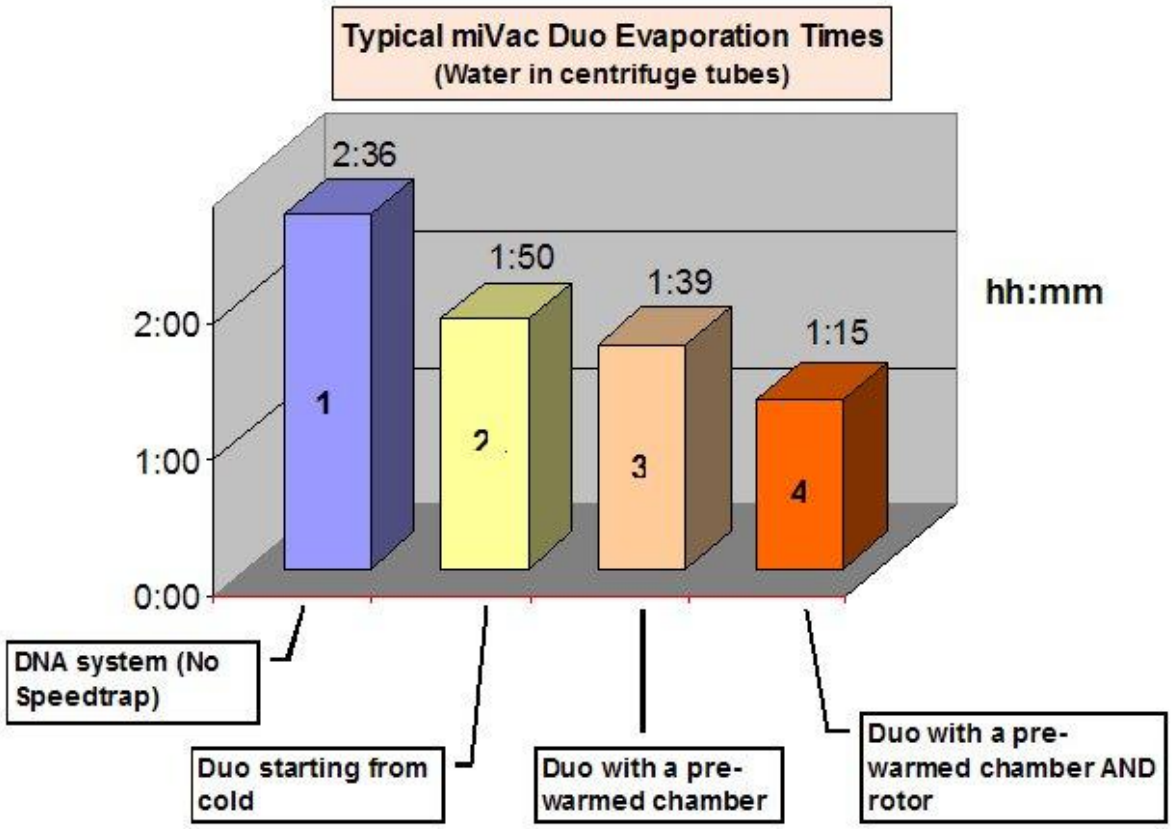
Samples in the concentrator chamber are subjected to accelerations of up to 250 G. It is therefore important for the operator to understand the safety requirements and to gain familiarity with the safe loading procedure outlined below.

Preparation

To reduce concentration time, the system can be pre-heated before use. If rapid concentration is important, leave the empty rotor in the concentrator with the lid shut and pre-heat enabled; short evaporation runs in particular will benefit from this. Refer to ***Pre-heat*** for further details.

Caution: To avoid damage to samples, do not pre-heat with the samples loaded.

The following graph shows the typical reduction in concentration time that can be achieved, firstly by using a SpeedTrap, and then by pre-heating both chamber and rotor.



Loading

- Balance the rotor within 10 g
- Only load tubes or vials into the rotors that are specified on the rotor
- For the Duo, two position swing rotor, use a maximum of three shallow well microplates (with stackers) or one deep-well microplate per rotor location
- For the Quattro, four position rotor, use a maximum of five shallow well microplates (with stackers) or two deep-well microplates per rotor location
- Only fill wells of microplates to 66% of their maximum fill level
- When using swing rotors, always load opposite swings with the same or similar type of plates
- Do not exceed the maximum safe loading weight of 0.6 kg per swing for Duo swing rotors, and 1.1 kg per swing for Quattro swing rotors

Final checks

- Make sure tubes / vials are located correctly in the rotor
- For swing rotors, rotate a swing rotor by hand after loading to check that all plates are correctly located before starting a run and before re-starting an interrupted run.

Method Guide

Pre programmed methods

The concentrator has three pre-programmed methods; during the evaporation process, air is vented into the evaporation chamber to optimise evaporation conditions for the solvent. The amount of venting is determined by the method selected:

Method	*Venting rate*	*When to use*
H2O	Low	For water only
-OH	High	For alcohols and alcohol mixtures
---	No venting	For all other solvents

The -***OH*** and ***H2O*** methods also turn the pump off periodically to aid the flow of energy into the samples.

For Duo and Quattro concentrators, the ***H2O*** method is optimised for aluminium rotors. This method is recommended when evaporating more than a few tubes of water; however, full vacuum **---** may be faster if there are just a few tubes.

For DNA systems, use the ***H2O*** method when evaporating water or solvents with similar boiling points.

Alternatively, the performance of any miVac modular system can be enhanced with the addition of a pressure controller which allows automated pressure control and vacuum ramping. If a pressure controller is used, the miVac concentrator must be set to **---** (no venting).

SpeedTrap™

The SpeedTrap mode can be set to optimise conditions for the solvent:

Switch position	*SpeedTrap Mode*	*When to use*
	Periodic defrost	For water or water mixtures
	No defrost	For organic solvents that will not freeze

Acceptable solvents

Solvent	*Abbreviation*	*Recommended method*	*SpeedTrap mode*	*All systems*
Acetic acid		*---*	❄	✓
Acetonitrile	ACN	*-OH*	❄	✓
Acetone		*-OH*	❄	✓
Ammonium Hydroxide		*H2O*	❄/♨	✓
Butan-1-ol		*--- or H2O*	❄	✓
Butan-2-ol		*--- or H2O*	❄	✓
Butyl Acetate		*H2O*	❄/♨	✓
Chloroform	TCM	*-OH*	❄	✓
1,2-Dichloroethane		*-OH*	❄	
Dioxane		*H2O*	❄/♨	✓
Ethanol	EtOH	*H2O or -OH*	❄	✓
Ethyl Acetate		*-OH*	❄	
Formic Acid		*---*	❄/♨	
Heptane		*-OH*	❄	
Hexane	Hex	*-OH*	❄	✓
Methanol	MeOH	*H2O*	❄	✓
Methyl Tertiary Butyl Ether		*-OH*	❄	
Methylene Chloride	DCM	*-OH*	❄	✓
Propan-1-ol or Propanol		*-OH*	❄	✓
Propan-2-ol or isopropyl		*-OH*	❄	✓
Alcohol	IPA	*-OH*	❄	✓
Tetrahydrofuran		*-OH*	❄	
Toluene		*--- or H2O*	❄	
Water		*H2O*	❄/♨	✓

Caution: Solvents that do not have a symbol "✓" in the ***All systems*** column**,** can only be used in systems where all units (concentrator, SpeedTrap and pump) were manufactured after April 2007. The date of manufacture is shown on the instrument's serial plate.

Maintenance

In order to provide trouble free operation, Genevac recommend the miVac pump is serviced annually. Any servicing or repair of miVac products, other than that which is specified within this User Manual, should be carried out by Genevac personnel (or approved representatives of Genevac) using only approved spare parts.

Recommended practice

Check before use:

All hose joints are secure

- The SpeedTrap collection jar, empty if necessary
- The catch-pot is connected to the pump exhaust, empty if necessary.

Cleaning

- Clean the SpeedTrap collection jar at regular intervals
  - Collection jar is dishwasher safe but not suitable for an autoclave
- Clean the lid, lid seal, exterior paintwork and inside of the chamber with a soft, lint-free cloth, slightly dampened with:
  - Detergent solution
  - Bleach solution (if using biological agents)
  - Methanol
  - Ethanol.
- Do not use abrasives.

Concentrator lid seal

Parts required

Description	*Part number*	*Quantity*
Lid seal - Duo	04-4722	1
Lid seal - Quattro	04-4793	1

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 miVac concentrator and open the lid.
2. Check for solvent traces and wipe the lid seal clean before removal.

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

3. 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 lid seal on top of the vacuum chamber.
3. Work the seal firmly into position using only fingers, press the seal fully home.

Testing

1. Close the lid.
2. Select any method and start the concentrator.
3. Make sure the pressure begins to drop (the lid seal feels tight against the chamber and cannot be opened).

Note: Manual pressure may be required on the lid to assist 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.

4. Allow the concentrator to continue for a while, checking for normal operation.

Completion

Dispose of the defective seal and packaging.

Spindle friction washer

The friction washer prevents rotor slippage during spin-up and spin-down. Check the condition of the washer frequently and replace it if damaged or worn.

Parts required

Description	*Part number*	*Quantity*
Friction washer	RTR-FRICT-001	1

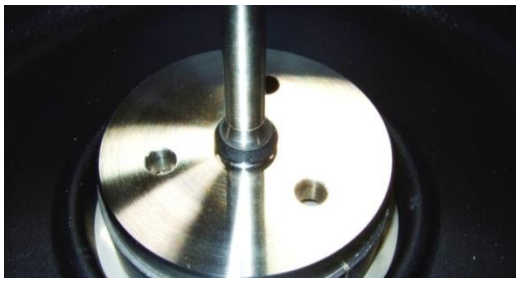
Removal

Remove the damaged washer from the concentrator spindle.

Refitting

1. Place the washer over the spindle.

2. Push down to form a conical shape at the base of the spindle.



SpeedTrap jar seal

If the SpeedTrap jar fails to seal or does not tighten when inserted and twisted a quarter turn, the seal and thread inserts should be replaced.

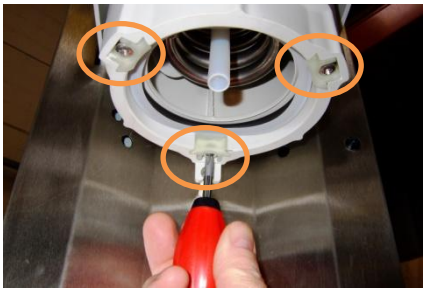
Parts required

Description	*Part number*
Replacement seal and thread insert kit	MST-SEALS-000

Removal

1. Remove the SpeedTrap jar.

2. Using the screw driver, undo the screws and remove the three thread inserts as shown.



3. Remove the PTFE seal and O-ring.

Refitting

1. Insert the O-ring into the SpeedTrap moulding.

2. Insert one of the three retaining features of the PTFE seal into one of the three recesses in the SpeedTrap moulding and secure it in place using a thread insert and screw. Do not tighten the screw.

3. Taking care to avoid creasing or distorting the PTFE seal, fit the remaining two thread inserts.

4. Check the PTFE seal and O-ring are correctly fitted with no creases or bulges, then tighten all three screws.

Testing

1. Fit the SpeedTrap jar and check it jar feels tight.

2. Operate the miVac system to make sure there are no vacuum leaks, use “dummy” samples if necessary to make sure the concentrator operates correctly.

Unpacking and Setting Up

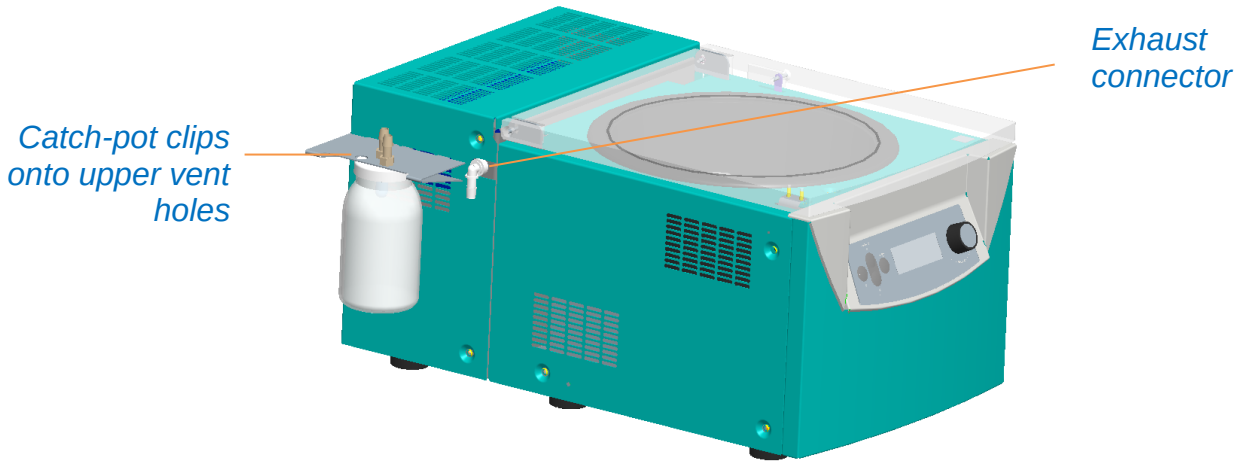
On delivery, please check the contents of the delivery as soon as possible against the delivery note and notify your distributor immediately if any parts are missing or damaged. Refer to our web site for up to date contact details.

Installation site

The miVac system must be placed on a level, sturdy work surface. Make sure there is enough space for a 50 mm air gap between each of the miVac units and the edge of the bench, a wall or any other equipment.

DNA

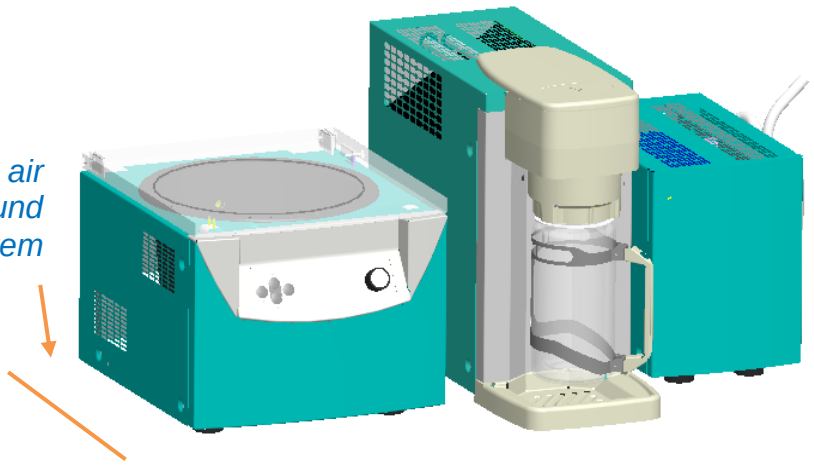
The DNA Concentrator, with its built in pump, can be easily positioned on most benches. Fit the catch-pot to the upper vent holes on the concentrator; connect the short tube between the exhaust connector on the pump and the catch-pot. Connect the mains power cable supplied.



Modular systems

The following example refers to a Duo concentrator, SpeedTrap and Duo pump; the set-up process is much the same for the Quattro concentrator and Quattro pump.

Position the concentrator, SpeedTrap and pump on the workbench as shown:



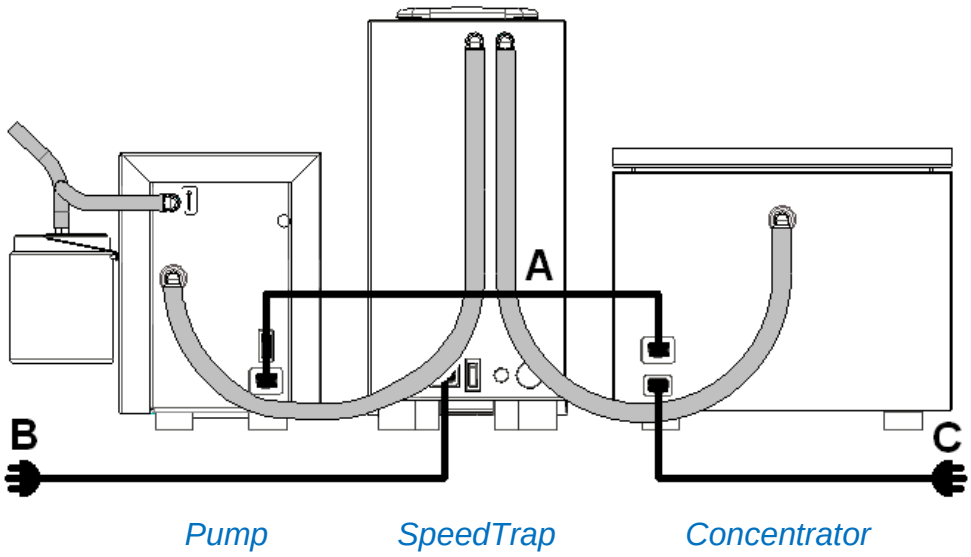
Connect the pump catch-pot by clipping it onto the cladding vent holes, on the side of the vacuum pump.

Connect the units together using the 12.7 mm (½") vacuum hose supplied, cut to length using the hose cutter. Secure the hoses with hose clips as shown.

If the modular system does not have a SpeedTrap, connect a single vacuum hose between the concentrator and the pump.

Note: Hoses, hose clips and the hose cutter are available in the miVac connection kit, extra lengths of vacuum and exhaust hose are also available. Refer to the ***Options*** section for details.

Once the hoses are fitted, refer to the following diagram and connect the electrical cables.



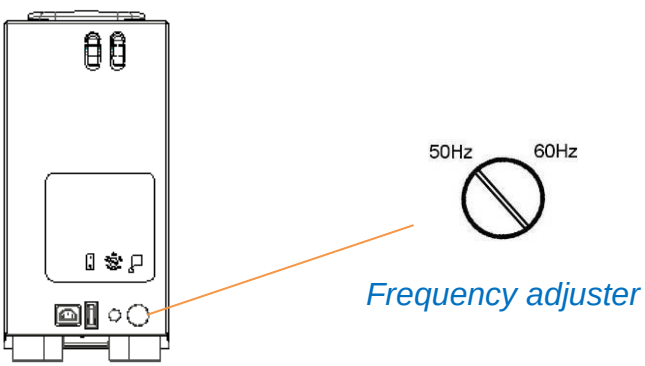
Connect the pump to the concentrator using the interconnecting cable **A**.

Connect two mains power cables (**B** and **C),** one to the concentrator and one to the SpeedTrap.

Note: Do not connect the pump directly to the mains power supply. If a cable is supplied, this is for standalone use of the pump only.

Irrespective of the model of miVac pump, the connections and function are the same. When used with the miVac series of concentrators the electrical power is supplied and controlled by the concentrator using the interconnecting lead. When used with non miVac concentrators the power lead is connected to the mains power supply.

Caution: If setting-up a system for use in Japan, make sure the frequency adjuster on the rear of the SpeedTrap is set to the correct frequency for the local mains power supply.



Lyo option

Using the cooling vents on side of the SpeedTrap as mounting holes, and fit the lyo option isolation valve bracket to the SpeedTrap.

Note: Different sized screws are supplied to allow the bracket to be fitted to either side of the SpeedTrap.

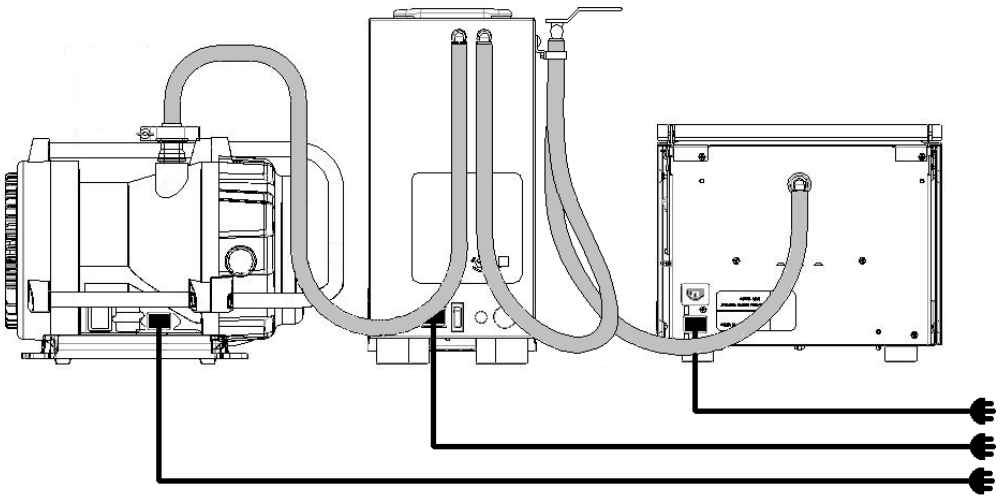
Using a length piece of vacuum pipe, connect the concentrator to the isolation valve.

Using another length of vacuum pipe, connect the other side of the isolation valve to the SpeedTrap vacuum inlet.

Fit the isolation valve to the bracket , as shown.

Connect the remaining vacuum pipe between the SpeedTrap and the scroll pump system.

To complete the installation, connect the mains power supply cables to the scroll pump, SpeedTrap and concentrator.

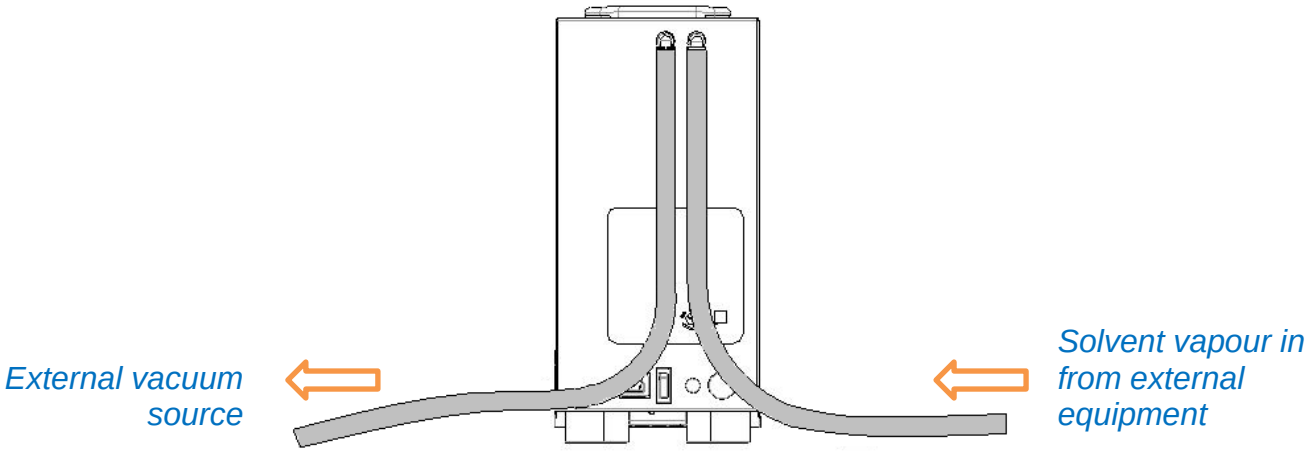


If required, the miVac SpeedTrap can be set up as a stand-alone system without the need for a concentrator to be connected (refer to front cover illustration). In this case, the isolation valve should be left permanently in the closed position, and the concentrator pipe need not be connected.

If the miVac system features a pressure controller, this can remain connected to the vacuum line between the pump and the SpeedTrap, as shown.

Stand-alone SpeedTrap

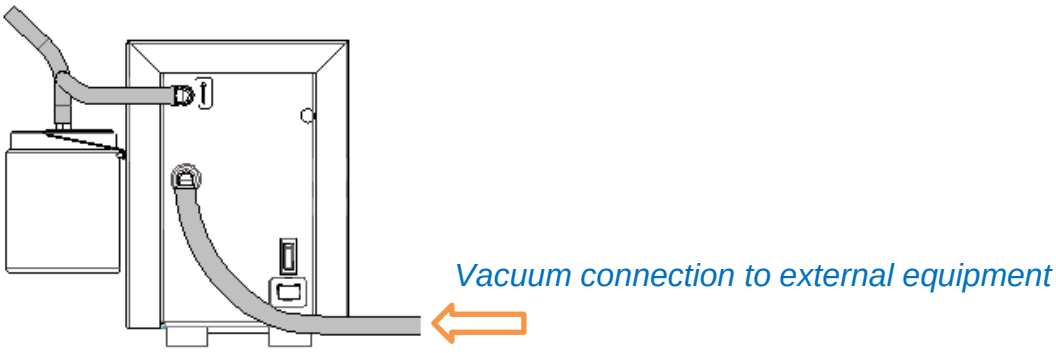
If connecting a miVac SpeedTrap to equipment, other than a miVac modular system, connect it as shown:



Using the power cable supplied with the SpeedTrap, connect the SpeedTrap to the mains power supply.

Stand-alone pump

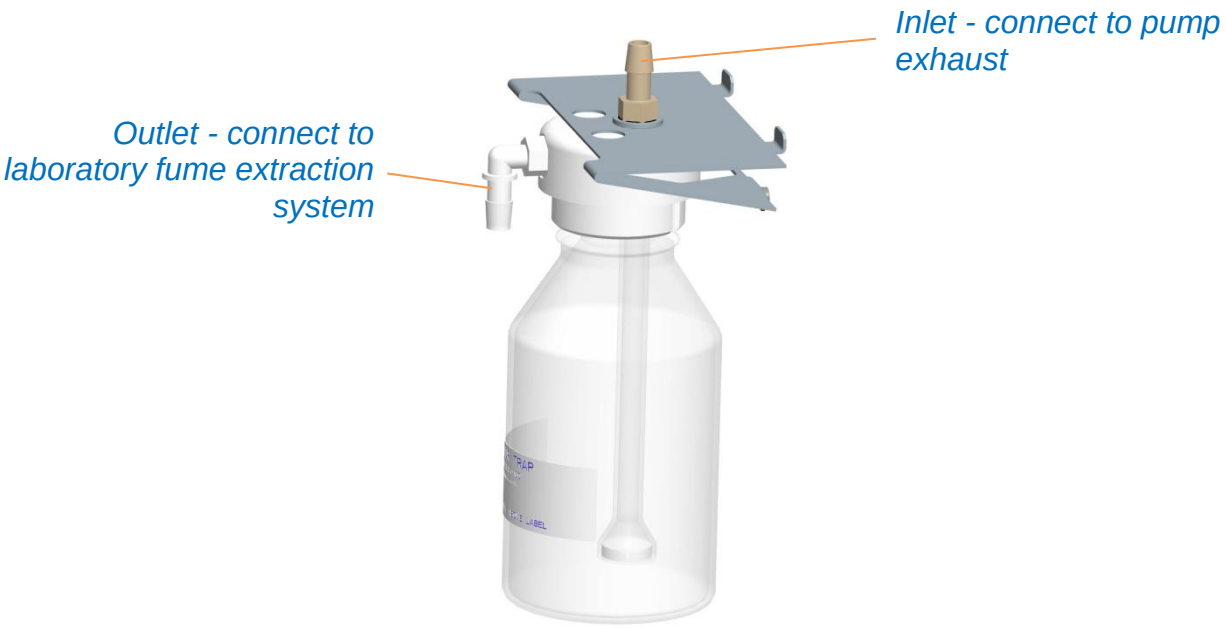
If connecting a miVac pump to equipment other than a miVac modular system, connect it as shown:



If using a catch-pot, fit it to pump by clipping it to the cladding vent holes, on the side of the vacuum pump. Using the power cable supplied, connect the pump to the mains power supply.

Vapour trap

To install the optional vapour trap, remove the pump catch pot and replace it with the vapour trap. Connect the pump exhaust to the vapour trap top connector (inlet), connect the outlet elbow connector to the laboratory fume extraction system.



Final checks

Carry out a safety assessment before operating the miVac system. Make sure the exhaust hose takes solvent away from personnel, and from the system, in a safe manner.

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

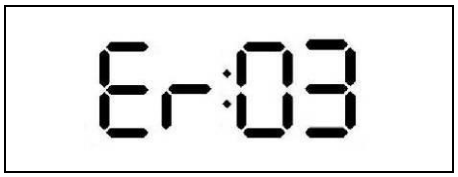
Maintain a solvent vapour free environment around the miVac system. Do not use the free space around the system for the storage of vessels containing solvents or acids. This instruction applies, even if the miVac system is installed in a fume cupboard.

Caution: After setting up, leave the SpeedTrap in the upright position for 24 hours before switching on.

Troubleshooting

Faults and errors

If the miVac system detects a problem; an error number is shown on the LCD display. When errors occur during operation, the error number is shown when the system stops.



Rectifying faults and errors

Err code	*Cause of error*	*Rectification*
01	Software error – memory failure	Clear error and attempt to restart
02	Lid not closed during run	Make sure lid is closed and engaged with latch
		Check lid seal is fully seated
03	Lid not locked during run	Make sure lid is closed and engaged with latch
		Check lid seal is fully seated
04	Motor drive error	Clear error and attempt to restart
05	Rotor failed to spin	Manually rotate rotor approximately 45° and restart
06	Rotor failed to reach speed	Make sure rotor spins freely
		Check mains power supply within tolerance
07	Rotor stops unexpectedly	Make sure rotor spins freely
		Check mains power supply within tolerance
08	Lid failed to lock	Make sure lid is closed and engaged with latch
		Check lid seal is fully seated
09	Lid failed to unlock	Make sure lid is closed and engaged with latch
		Make sure user not lifting lid against latch
		Check lid seal is fully seated
10	Software error – sensor read error	Clear error and attempt to restart
11	Software error – chamber temperature low	Clear error and attempt to restart
12	Software error – chamber temperature high	Clear error and attempt to restart

Clearing faults and errors

To clear an error, press and hold the ***STOP*** button for five seconds. Alternatively, switch the system power off, wait five seconds and then switch the power back on again. If the problem is still apparent, contact your distributor or Genevac Service.

Opening lid without power

In the event of a power supply failure, the lid can be unlocked manually to allow access to samples. Using a narrow tool, inserted through the hole in the cladding (above the top left hand side screw) press on the lid lock actuator to open the lid.

Warning: Risk of injury, make sure the rotor is stationary and the system has vented to atmospheric pressure before opening the lid. Wait at least two minutes following a power failure before opening the lid.

Other troubleshooting

Symptom	*Cause*	*Corrective action*
Display blank	No power	Check power supply / lead
Lid will not open / difficult to open	Dirty lid seal	Clean lid and seal
		External control valve (if fitted) wrong way round
Rotor will not spin - double beep	Lid not fully closed	Open and close lid
		Check lid seal fully seated
		Check for obstructions
	Rotor jammed	Check for freedom of rotor
Rotor will not stop	Rotor spindle greasy or slippery, rotor continues to spin after spindle stops	Clean / degrease rotor and spindle. Fit spindle friction washer (or replace if defective).
Excessive vibration / noise	Rotor imbalanced	Check and rebalance rotor
	Rotor slipping	Clean / degrease rotor and spindle, fit spindle friction washer
	Missing exhaust silencer / muffler	Replace exhaust silencer / muffler
	Uneven work surface	Take corrective action
Chamber fails to reach programmed temperature	Heat time not set or insufficient	Adjust
Solvent splashes / condensation inside vacuum chamber	SpeedTrap not operating correctly	See ***SpeedTrap***
	Poor vacuum	See ***Maintenance***
	Overfull plates	See ***Loading Samples***
	Concentrator vacuum chamber too cold	Pre-heat before use
Vacuum problems	Pump not running	Check connections / mains power supply
	Lid seal leaks	Check for damage / dirt. Clean if required
	Hoses	Check for leaks
		Check for blockages
		Check connections
	Control valve (if fitted) not opening	Check connected to concentrator pump outlet
		Check vapour flow direction
	Condenser jar not sealed	Remove jar and check seal for damage / debris
		Replace seal, see ***Maintenance***
	Pump inefficient	Run system without samples for five minutes. Repeat three times then reload samples
	Exhaust silencer / muffler blocked	Replace exhaust silencer / muffler
	SpeedTrap jar seal leaking	See ***Maintenance***: ***SpeedTrap jar seal***
	Condenser jar full	Empty jar
	Pump needs servicing	Contact your distributor
Excessive concentration times	Poor vacuum	See ***Maintenance***
	SpeedTrap not operating correctly	See ***SpeedTrap***
	Insufficient chamber heat	Adjust Heat time
Excessive solvent in pump	SpeedTrap not operating correctly	See ***SpeedTrap***
	Incorrect run settings	Select run settings suitable for your solvent

Other troubleshooting – continued

Symptom	*Cause*	*Corrective action*
miVac pump runs continuously	Connected directly to mains power	Connect to concentrator using interconnecting lead
Excessive sample odour	Solvent vapour exhausting in to lab	Check connections
		Check pump / system exhaust ducted to suitable fume extraction point
No SpeedTrap LED illumination	No mains supply	Check SpeedTrap mains power supply lead
Excessive boiling of solvent in SpeedTrap jar	Warm solvent	Stop run and empty jar, restart run
No solvent in SpeedTrap jar	Excessive vacuum	Check vacuum appropriate to application
	Incorrect run type	Select suitable run type
	Poor cooling	Allow SpeedTrap to cool for 30 minutes with no concentration, then Restart run
		Check LED status
		Check air flow, ensure vents are clear from obstruction
Poor solvent recovery	Excessive vacuum	Check vacuum appropriate to application
	Incorrect run type	Select suitable run type
	Poor cooling	Allow SpeedTrap to cool for 30 minutes with no concentration, then restart run
		Check LED status
		Check air flow, ensure vents are clear from obstruction

Technical Data

Specifications

DNA concentrator

Max rotor speed	1465 rpm
Sample acceleration	250 G
Drive system	Permanent magnet electronic
Dimensions (w x d x h)	360 x 602 x 300 mm
Catch-pot	Add 141 mm to width
Weight	41.5 kg

Duo Concentrator

Max rotor speed	1465 rpm
Max sample acceleration	250 G
Drive system	Permanent magnet electronic
Dimensions (w x d x h)	360 x 424 x 300 mm
Weight	21 kg

Quatro concentrator

Max rotor speed	1130 rpm
Max sample acceleration	250 G
Drive system	Permanent magnet electronic
Dimensions (w x d x h)	480 x 594 x 300 mm
Weight	35 kg

SpeedTrap

Type	Single stage vapour compression
Refrigerant	R404a
Ultimate low temperature	-50°C
Ultimate defrost temperature	+60°C
Rapid defrost	Yes
Rapid defrost over-ride	Yes (after Feb 2011)
Jar	Plastic coated borosilicate glass
Jar capacity	1 litre (optional 2 litres)
Dimensions (w x d x h)	212 x 563 x 450 mm
Weight	25.8 kg

Duo pump

Ultimate vacuum	10.0 mbar (7.5 torr)
Flow rate	38 litres per minute
Dimensions (w x d x h)	215 x 389 x 300 mm
Weight	19 kg

Quattro pump

Ultimate vacuum	2.0 mbar (1.5 torr)
Flow rate	33 litres per minute
Dimensions (w x d x h)	215 x 389 x 300 mm
Weight	18 kg

Super high vacuum pump

Ultimate vacuum	0.15 mbar
Flow rate	83 litres per minute
Dimensions (w x d x h)	249 x 427 x 288 mm
Weight	23 kg

Storage / transportation environment

Ambient temperature	-10°C to 55°C
Relative humidity	0 to 95%
Altitude	Sea level to 12000 m

Operating environment

Ambient temperature	0°C to 30 °C
Relative humidity	0 to 95%
Altitude	Seal level to 1600 m

Note: This evaporator is designed for use in a pollution degree 2 environment (normally only nonconduictive pollution occurs).

Emissions

Noise levels typically 70 dB (A) at one metre from the concentrator during normal operation.

For the purpose of air conditioning requirement calculations, it can be assumed that all power is dissipated as heat

Note: Dimensions include allowances for pipe connections and for lid opening; figures quoted for weights are for guidance only (actual weights vary with build options such as mains input voltage).

Electrical

	Voltage (V)	Freq (Hz)	Power VA (W)							
			DUP & DUC		DUP & QUC		MST			
			Peak	Norm	Peak	Norm	Peak	Norm	DUP	QUP
USA	120	60	590	390	850	470	495	452	250	150
UK & Europe	230	50	590	380	890	450	435	429	250	150
	220	60	520	340	800	430	495	441	250	150
Japan	100	50	500	360	630	370	430	360	250	150
Japan	100	60	490	350	660	400	450	389	250	150

Key	
DUP	Duo pump
DUC	Duo concentrator
QUC	Quattro concentrator
MST	SpeedTrap

For DNA concentrator, refer to Duo concentrator with Duo pump. Figures for normal running power (norm) err on the high side (based on the heater being on for 30% of the run time, typically heat is on for 5 to 10% of the run).

Note: The systems may momentarily take current in excess of these figures. Genevac therefore recommend the use of appropriately rated type C or D circuit breakers on the main supply.

EC declaration of conformity

EC Declaration of Conformity: miVac Products

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):

DNA Concentrator, models:	DNA-23050-x00*
Duo Concentrator, models:	DBP-23050-x00, DUC-23050-x00, DPP-23050-x00
Quattro Concentrator, models:	QLP-23050-x00, QUC-23050-x00, QHP-23050-x00
SpeedTrap, models:	MST-23050-x00
Duo Pump, models:	DUP-23050-x00
Quattro Pump, models:	QUP-23050-x00
Super Vacuum Pump, models:	SVP-23050-x00
Control Valve, model:	UOP-00000-Y00
Serial Numbers from:	Individual declarations are available on request

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)

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: 2001 (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. General EMC requirements)
- BS EN 12100-1&-2:2003+A1:2009 (Safety of machinery. Basic concepts, general principles for design & technical principles)
- BS EN 378-2:2008+A1:2009 (Refrigerating systems and heat pumps. Safety and environmental requirements. Design, construction, testing, marking and documentation)

Signed: 

Position: Chief Electrical Engineer

Name: G. Broadbent

Date: 10th March 2010

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

*** Where "X" = A, B, D or F and denotes the power lead code appropriate to the destination country.**

Warranty statement

This product is guaranteed for period of 12 months from the date of delivery. 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 the user manual
- The unit may only be used for the purpose it was sold, and in accordance with Genevac published compatible solvent list
- Regular cleaning and preventive maintenance schedule to be adhered to as detailed in the user manual. See ***Maintenance***
- 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 would invalidate the warranty and result in the costs of repairs being charged. This warranty does not cover accidental damage, modification, misuse or inappropriate repair by untrained personnel, and does not cover consumable items

Patents

miVac products are protected by the following patents and patent applications:

1153278 FR

Amendment control

Issue	*Reason for change*	*Date Issued*
2-1	Revise layout includes many changes from previous issue.	4 Feb 11
2-2	Expand Pre-heat instructions and add section in Troubleshooting. Expand instructions for setting chamber temperature and heat time. Remove list of rotors. Revise electrical specifications. Add entrapment safety warning to Opening the Lid. Add recommended pump service interval.	07 Mar 11
2-3	Referred to DNA concentrator in place of DNA, flow of energy in place of heat-flow, solvent being condensed in place of solvent being concentrated.	23 Mar 11
2-4	Add troubleshooting, rotor slipping. Standardised conventions across all manuals: Move Standby mode before Controls. Changed Check before use to Recommended practice. Update DNA image. Add instruction to replace pump catch-pot with vapour trap. Add recommended Method and SpeedTrap Mode to Acceptable Solvents table.	05 Mar 12
2-5	Add SpeedTrap jar seal maintenance. Add SVP specifications, update dimension and weight specifications. Add Lid seal maintenance. Amend environment specification: pollution degree 2. Add spindle friction washer replacement instructions.	27 Jul 12
2-6	Update MST seal kit part number and Spindle friction washer part number.	5 Sep 12

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Useful Information

Read these instructions before operating the miVac pressure controller and keep them near the system 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 Representative 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.