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HT Solvent Evaporator Series



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Introducing the HT Series from Genevac – World leader in solvent evaporation technology for life science research

The HT Series from Genevac is a range of high-performance centrifugal evaporators designed with the specific needs of life science research in mind. From the compact HT-4X to our HT-24 system, each HT evaporator carries the hallmark of Genevac design:

- *Total sample protection*
- *Flexibility for multiple applications*
- *Quick results*
- *Robust build quality*
- *Easy to Use*
- *Comprehensive applications support*

These basic principles are further refined by our patented core technologies which protect your valuable samples and improve workflow through your laboratory. Great features like Automatic Method programming based on stored solvent selection, Auto Stop When Dry, Dri-Pure® anti-bumping control and optional auto-defrost and drain, help improve productivity and give you better results. You will only find these features on the world class Genevac HT series evaporators.

By choosing Genevac technology, you are investing in 20 years experience in solvent removal, in countless patents and cutting-edge technologies, culminating in the HT Series. All of our know-how, the fruits of our research and, importantly, the feedback from our customers is embodied in these state-of-the-art evaporators. Once you've tried a Genevac HT Series evaporator in your laboratory you'll soon wonder how you got by without one!

This booklet gives you plenty of details on the entire family, but it cannot substitute for the real thing. To arrange a demonstration of the latest Genevac evaporator in your laboratory, visit our website www.genevac.com or e-mail us **salesinfo@genevac.co.uk**



Rigorous quality control underpins our designs to give you years of reliable service

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What is a Centrifugal Evaporator?

The principle behind centrifugal evaporators is very simple; as atmospheric pressure reduces, the boiling point of a given solvent also reduces. When the pressure reaches a certain point, boiling will commence. As boiling occurs, the solvent can 'bump' out of the container in an uncontrolled way and spoil the sample. To overcome this, samples can be spun in a centrifuge to apply sufficient g-force to keep everything in the tube. Combining these two principles together produces the vacuum centrifuge, or centrifugal evaporator.

The samples are housed in centrifuge-style holders mounted on a rotor arm inside a sealed vacuum chamber. As the centrifuge rotor gathers speed, the sample holders pivot into a horizontal position and everything is then held in place by the applied g-force. The heat energy required for rapid evaporation is provided by powerful infra-red heater lamps mounted in the centrifuge wall. Solvent vapour boiling off the samples is pumped away to a refrigerated cold trap that condenses the vapour and by doing so, helps maintain the chamber pressure, an effect called cryopumping. Finally an efficient vacuum pump is used to evacuate the chamber and maintain low pressures.

In the HT-4X, the condenser is housed inside the main evaporator, whilst in the HT-8, -12 & -24 the condenser is external. In most cases the pump is externally mounted. These components can be mounted together for convenience on a dedicated trolley, or as individual units positioned under the bench or alongside the evaporation chamber.

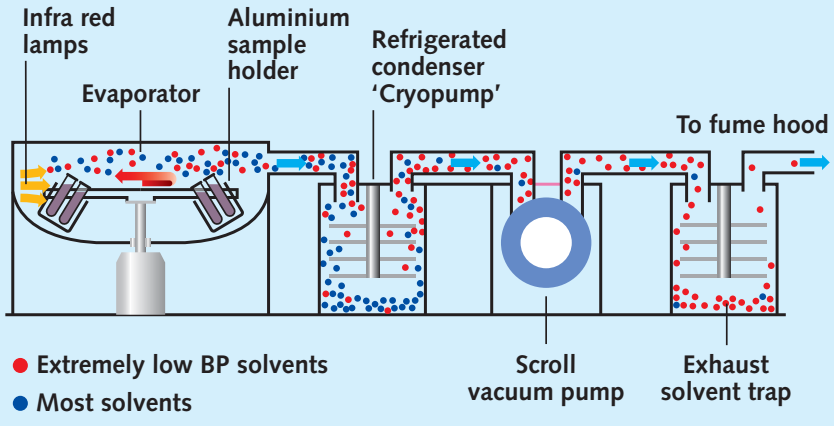
HT series evaporators can handle a very wide variety of samples formats, including SampleGenie™. Standard holders are available for tubes, vials, reaction blocks, microplates and now, flasks. Blocks from our unique Gilson, Waters and Shimadzu compatible fraction-collector racks will also fit directly into the evaporator.



HT technology at a glance

- ***Dri-Pure® Anti-Bumping control***
  Eliminates the unwanted effects of bumping, maintaining sample integrity
- ***SampleGuard® temperature control***
  Prevents heat damage to samples, while ensuring rapid evaporation
- ***New easy to use software, featuring;***
  - *Pre-programmed evaporation methods*
  - *Ideal for SOPs*
  - *Auto Solvent Data selection*
  - *Auto Stop when all samples dry*
  - *Password protection of methods*
  - *Edit method parameters 'on the fly'*
- ***Real time graphical display***
  Full colour display of run data provides feedback on progress of evaporation
- ***High imbalance tolerance***
  Ideal for use where samples dry at differing rates
- ***Auto Shutdown following the end of the evaporation process***
  Reduces power consumption and unnecessary system wear
- ***Widest range of sample holders***
  Provides ultimate flexibility for every application
- ***High-efficiency pumps***
  Oil-free vacuum pumps for extended service and minimal maintenance

Principle of centrifugal evaporation



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To help you get the very best results from your evaporation system, Genevac normally provides applications support free of charge for the life of the system. Whether you require routine or refresher user training, or help with choosing or optimising the most appropriate method for your samples, Genevac is always here to help. Contact our applications team by sending an e-mail to applications@Genevac.com or contacting you local Genevac representative.

To optimise your laboratory workflow and eliminate a potential evaporation bottle neck, Genevac has developed a selection of methods and tools to help you.

Drying large volumes directly into vials

There are many situations where a large volume needs to be dried or concentrated and placed into a small vial. On some occasions a number of large volumes need to be dried and placed into one vial, e.g. when combining HPLC purification fractions.

Typically many stages are needed to achieve this seemingly simple end result, including:

- *Dry the large volume(s)*
- *Redissolve in small volume of strong solvent*
- *Pipette to final vial of choice*
- *Dry small vial*

During this process sample losses may occur and the integrity of the sample may be affected. Typically, DMSO is needed to dissolve the sample before transfer to the small vial. DMSO is very difficult to dry and residual DMSO will prevent an accurate dry weight being determined.

The SampleGenie enables all of this process to be achieved in one simple step, saving time by eliminating sample handling and therefore removing potential causes of sample loss and damage.

SampleGenie comprises a flask and sample holder technology which enables large volume samples to be dried or concentrated directly into the small vial of your choice. Where HPLC purification fractions are used, fractions are combined into one flask and dried, or fast lyophilised, into the final vial. Special Genevac sample holders have been created to accommodate SampleGenie in all Genevac evaporators. SampleGenie is compatible with most screw thread and crimp top vials and may be used with all common solvents.



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Fast lyophilisation



Traditionally evaporated



Lyophilised in Genevac

Fed up with producing sticky films, oils or gums? Want to lyophilise but don't have enough time to do it? Genevac has developed a set of fast lyophilisation methods to enable samples to be dried in little more time than by concentrating to dryness. The methods have been specially developed for use with HPLC fractions containing water and acetonitrile, or methanol.

Exceptional performance

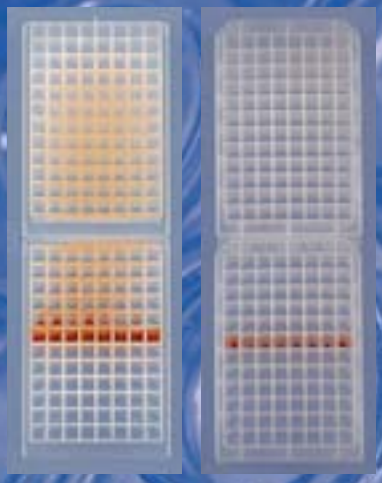
Traditional concentration to dryness in a Genevac evaporator is fast and safe. However, for some users a dried film is not the best answer. When working with certain solvents, e.g. HPLC solvents or DMSO, a fully dried result can be hard to achieve due to interactions with the dissolved sample – resulting in the formation of a gum or oil.

In response to customer demand, Genevac has developed the Fast Lyophilisation, or LyoSpeed™ process to resolve these problems for customers working with HPLC solvents. Using Genevac HT series evaporators, HPLC fractions can be automatically concentrated to a few millilitres and then frozen and rapidly lyophilised to produce a diffuse dry powder, which can easily be redissolved or weighed out.

Using LyoSpeed™ can take less than 6 hours for 15ml HPLC fractions and ensures that samples are dry every time, eliminating the need to reprocess those which fail to dry. The equivalent speed if drying samples sequentially is as fast as 3 minutes per tube! The LyoSpeed method may also be used with SampleGenie.

Dri-Pure®

By offering total protection against the effects of unpredictable solvent 'bumping', Dri-Pure® reduces and, in all common cases, eliminates cross contamination and sample loss. It combines a gentle, ramped application of vacuum with significantly increased g-force, in order to prevent the ejection of superheated solvent and solute from test tubes or microtitre plate wells.



With the Dri-Pure anti-bumping system off (left), cross contamination is visible. With Dri-Pure on (right), cross contamination does not occur. Ask for a detailed paper on this subject.

Auto-Defrost & Drain

Auto-Defrost & Drain is an option for the standard condensers on Genevac HT-4X, HT-8/12 series 2 and HT-24 Workstation. Auto-Defrost & Drain enables the system automatically to drain the condenser of volatile solvent(s) between stages in a method, and at the end of the method to fully defrost and drain the system with no user intervention. When performing an intermediate drain (i.e. mid method), the system also does a short defrost just in case residual solvent from the previous use has frozen in the outlet pipe of the condenser. The intermediate drain can only be used to remove volatile solvents.

Benefits of Auto-Defrost & Drain

The principal benefit of the Auto-Defrost & Drain function is to eliminate volatile solvent(s) removed from the condenser. Volatile solvents will boil off first and be collected in the condenser, to remove the higher boiling point solvents, low pressures must be achieved however, this often will cause the volatile solvent to boil out of the condenser and 'spoil' the vacuum level. Vacuum spoiling affects final dryness of samples, or in the very worst cases, the ability to evaporate the higher boiling point solvent at all. Until now, the user had to be present to overcome these problems by draining the condenser after the volatile solvents had been removed, but this can now be automated. An additional benefit of Auto-Defrost & Drain is that volatile solvents are collected and can be safely disposed of, reducing VOC emissions.

Flexibility

A Genevac evaporator enhanced with Auto-Defrost & Drain functionality can not only be used as part of the LyoSpeed™ process (see this page), but will also deliver improved results when working with any mixture of solvents with differing boiling points.

When evaporating HPLC fractions, Auto-Defrost & Drain will help achieve excellent final dryness. Mixtures of DCM and DMSO or DMF are almost impossible to evaporate without draining the cold trap once the DCM is removed, and before the higher boiling point solvent is tackled. This is now possible with a system which is Auto-Defrost & Drain enabled.

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1 Colour LCD screen
2 Built in PC
3 Robust lid
4 Powerful infra red heater lamps
5 SampleGuard™ temperature control
6 Solid aluminium sample holders
7 Exhaust outlet
8 Integral 2.3L condenser and refridgerated exhaust trap
9 Drain valve linkage
10 Chamber, condenser and exhaust pot drains
11 Direct drive motor
12 High strength rotor
13 Computer optimised vapour flow path
14 Remote lid control (optional)
15 Cast aluminium vacuum chamber
16 Lid open button

- ***Embedded PC*** *and full colour screen with remote control and data logging*
- ***Standard*** *85g out-of-balance capability and safety cut-out*
- ***Strong*** *rotor for sample loads of up to 1.5kg on each sample swing*
- ***Auto-shut down*** *for walk-away operation*
- ***Corrosion proof*** *against trifluoracetic acid and other corrosive vapours*
- ***Stored methods*** *– ideal for multi-user environments*
- ***Remote control and data logging*** *– ideal for method development*

Genevac's HT–4X is built upon the cornerstone technology of the HT Range and sets new standards for a bench-top solvent evaporator. This four-position workhorse is our most popular unit for drug discovery laboratories requiring higher throughput and more sophisticated control than our entry-level EZ-2 range can provide. Genevac's easy-to-use HT-4X was developed in co-operation with pharmaceutical research scientists to achieve highly efficient, large capacity sample processing within compact dimensions. The new built-in 2.3L dual chamber refrigerated condenser combines a powerful cryopump and solvent recovery system, to remove volatile solvents quicker with better waste solvent recovery than any other comparable system.



The cunning design of the drain valve actuator means it cannot be left in the open position inadvertently.

Features & options

Coolheat® technology — See opposite

SampleGuard® — See page 11

Dri-Pure® — See page 5

AD&D option — See page 5

High-power lamp option
Inert Purge option
Remote door switch
HCl resistance option

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Software in the latest 'X' model incorporates lyophilisation, using LyoSpeed, and a number of useful new features, such as 'auto stop when dry'. With the HT-4X, Genevac aims to ensure that all users achieve excellent results, quickly and without damaging delicate samples. New automatic solvent data selection makes run programming easy and removes the need for specialised knowledge of each solvent or mixture, whilst Dri-Pure® and SampleGuard® help to protect delicate samples from bumping contamination and overheating, respectively.

Working with a Genevac vacuum pump, the HT-4X will consistently remove DMSO at temperatures below 40°C and at pressures well below 0.5 mbar (critical for this application), and will achieve impressive evaporation rates. Multi-stage methods can be programmed via the built-in computer and colour screen to handle more complex evaporation tasks. This is especially useful for water and water/solvent mixtures, where a carefully controlled first stage can be used to quickly drive off the organic layer followed by a high power stage to remove the water and dry stubborn samples. Two specially developed high-power IR heat lamps provide the power required for high latent heat applications, such as water.

An option for Inert Purge Gas control is available for the HT-4X as well as remote-controlled lid opening from outside the fume hood, which allows residual vapours to disperse before unloading commences.

Auto-Defrost & Drain can be added to any HT series evaporator and enables fast and efficient evaporation of diverse mixtures of solvents, without compromising solvent recovery. This function is controlled by the system software and enables automatic draining of the cold trap in the middle of an evaporation operation, and/or full defrost and drain at the end of the cycle.

All of this technology is packed into a remarkably compact enclosure which means the HT-4X will fit in most commercial fume hoods. No wonder it is such a popular choice in drug discovery laboratories around the world.



coolheat® technology

The Coolheat® system dries samples rapidly, while a high speed vapour pumping system maintains low sample temperatures during evaporation. High power, high efficiency infrared lamps provide the uniform heat required for rapid evaporation and optional high powered lamps are available for power-intensive applications. Heat input can be controlled and is reduced automatically by SampleGuard™ before samples are dry, to ensure their integrity.



All Genevac infrared lamps feature reflective optics, with UV filtered lenses, to direct maximum radiant heat into the chamber where it is most needed.



Simple connections on the instrument rear panel allow for rapid installation in your lab, while an RS232 port enables connection to a PC for remote operation and data logging.

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Both models offer high capacity, a powerful condenser/cryopump system and unique Genevac features.

- ***High capacity design*** *takes 32 (HT-8) or 48 (HT-12) shallow-well plates*
- ***Fully PC controlled*** *for easy, flexible operation*
- ***Strong*** *rotor for sample loads of up to 1.5kg on each sample swing*
- ***Multi-stage runs*** *for maximum evaporation speed with high boiling point solvents*
- ***Corrosion proof*** *against Trifluoracetic acid and other corrosive vapours*
- ***Remote*** *control and data logging available*
- ***Remote door opening switch*** *allows residual fumes to clear*

Based on the same core technology as the successful HT-4X, these two machines are configured with multiple level rotors and front-opening doors. This gives significant increases in capacity without using extra bench space. The HT-8 system has a two-layer rotor capable of holding eight sample swings at one time. With shallow-well microplates in Genevac FastStack™ holders, 32 plates may be dried down together in an HT-8. Tube and vial capacities are similarly impressive; 320 tubes of 13mm x 100mm length can be run at one time.

For very high throughput applications the Genevac HT-12 presents a triple-deck rotor, pushing up the capacity even further to 48 microplates or 480 tubes 13 x 100mm. Formats may also be mixed within the evaporator, provided balance is maintained, so that combinations of tubes, vials, reaction blocks and microplates can be run simultaneously, although this is not recommended due to uneven parts wear.



Features & options

coolheat technology See page 7

SampleGuard® See page 11

Dri-Pure® See page 5

AD&D option See page 5

HCL option (HT-12 only)
High power lamp option
Inert Purge option

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All the great features of the HT-4X are carried over into these larger machines including the built-in PC and colour screen, Dri-Pure anti-bumping system, SampleGuard option, strong rotor with 85g imbalance tolerance, high-powered CoolHeat lamps, PTFE chamber coating throughout and of course the exceptionally flexible Genevac operating software.

Methods can be programmed for individual solvent types or mixtures and stored with a real name of up to 20 characters for easy recall. Up to 100 methods can be stored. For more complex applications, methods can be linked together to form multi-stage programmes suitable for the efficient drying of complex mixtures. Solvent data can now be recalled automatically from factory-set files for most commonly used solvents, speeding up method development considerably.

With the addition of SampleGuard temperature control, users can choose from three different methods of run termination. In two of these cases, the system will automatically shut down when dryness is detected without further manual intervention, allowing unattended overnight runs to increase productivity. A serial interface and software package allow remote data logging from the instrument to a PC.

When working with the most aggressive solvents such as hydrochloric acid and other acid chlorides, the HCl-proof option on the HT-12 is invaluable. This replaces all standard components in the vapour path with HCl-resistant materials for longer life and complete peace of mind. This option is only available on HT-12.

With both HT-8 and HT-12 systems, the powerful condenser/cryopump system is external to the evaporation chamber. The large 3.0L capacity condenser, shown opposite, can thus be conveniently sited under a bench or at the side of the evaporator. Its powerful condenser will maintain temperatures of –50°C and full condensing power for extended periods to give superb cryo-pumping performance and help maintain low pressure in the chamber. This is necessary for good performance with volatile solvents. In common with other systems in the HT series, an optional condenser flushing unit is available, extending condenser life by preventing damage from residual aggressive solvents.

Finally, for the highest throughput performance in this class, the HT-8 and HT-12 are available with the option of Auto-Defrost & Drain. Auto-Defrost & Drain can be added to any HT series evaporator and enables fast and efficient evaporation of diverse mixtures of solvents, without compromising solvent recovery. This function is controlled by the system software and enables automatic draining of the cold trap in the middle of an evaporation operation, and/or full defrost and drain at the end of the cycle.



HCl resistance and Auto-Defrost & Drain must be specified when ordering, as they cannot be retrofitted in the field.

HCl

Most Genevac evaporators are supplied as standard with heated PTFE coated chambers for best performance and longer life with solvents such as TFA. In addition, optional HCl resistance on HT-12 replaces all stainless steel components with inert fittings, leaving nothing to chance. It prolongs the useful life of your Genevac evaporator, even with routine use of concentrated HCl and other aggressive solvents. 6 Molar (6 normal) HCl may be used routinely in HCl resistant systems.





Segmented HPLC racks break down into blocks, which fit straight into the HT-12; four Gilson racks can be accommodated in one run.

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A Genevac oil-free scroll pump provides excellent vacuum performance for the HT-24, while a robust solvent waste pump removes condensate from both condensers to the solvent waste container.

- ***Maximum flexibility*** *with two independent chambers*
- ***Integrated services trolley*** *fits most walk in fume hoods*
- ***Twin 4.5L condensers*** *for efficient solvent recovery*
- ***Oil free scroll pump*** *for best vacuum performance*
- ***Automatic draining*** *with built-in waste container*
- ***Wide range*** *of available sample holders*

The HT-24 brings more flexibility to very high throughput evaporation than ever before. With one compact unit you can now evaporate two different non-reactive solvents simultaneously.

The HT-24 combines the versatility of two HT-12 evaporation chambers into the same space previously occupied by one system. However, the HT-24 is more than just two HT-12s on a new trolley. The HT24 benefits from a host of sophisticated new features designed to increase performance and productivity in your laboratory. Like so much patented Genevac technology, these useful features are not available on evaporators from other manufacturers.



The built-in solvent waste container is mounted in a useful drip tray, armed with a load cell to prevent spillage through overfilling.

Features & options

CoolHeat® Technology See page 7

SampleGuard® See opposite

Dri-Pure® See page 5

AD&D option See page 5

Scroll vacuum pump as standard
High-power lamp option

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Featured on the HT-24 are:

- *SampleGuard*
- *Dual 4.5L condensers*
- *High speed condenser defrost*
- *Automatic condenser defrost and drain option*
- *On-screen condenser status display*
- *Integrated solvent drain pump and waste container*
- *Integrated loading platforms*
- *Smart industrial trolley design*

The HT-24 has an incredibly high sample evaporation capacity of 96 shallow-well microplates, while providing fantastic flexibility, in that each chamber can be used independently. For example, one chamber could be used for library synthesis work and the other for work up or post synthesis purification. The HT-24 retains many of the features of the popular HT-12, including the ability to accept a wide range of sample formats, including microplates, tubes and vials together with Genevac's segmented Waters, Shimadzu and Gilson fraction collector blocks.

Auto-Defrost & Drain can be added to any HT series evaporator and enables fast and efficient evaporation of diverse mixtures of solvents, without compromising solvent recovery. This function is controlled by the system software and enables automatic draining of the cold trap in the middle of an evaporation operation, and/or full defrost and drain at the end of the cycle.

The HT-24 allows further process enhancement through the revolutionary twin VC4000 condensers. The VC4000 provides many time saving and performance enhancing functions, including automated mid-evaporation condenser draining function. This new feature improves evaporation performance and solvent recovery with solvent mixtures having widely differing boiling points by ensuring optimum vacuum at all times. Another useful addition is high power electrical heaters which enable rapid condenser defrosting, reducing turn around time. Waste solvent can be pumped automatically from condenser to waste container. Solvent waste containers can be changed at any time, using valved quick-release fittings. Audible and visible warnings prompt users when the waste container requires emptying.

The HT-24 has the same footprint as one HT-12 system, but packs in twice the capacity. The robust trolley is pressure-ventilated and ideal for inclusion in a walk-in fume hood. An alternative full enclosure trolley-mounted fume hood is available as an option. With superior performance, the HT-24 delivers twice the throughput of competing machines with apparently similar basic capacity.



Useful drawers beneath the evaporation chambers can be used to store consumables, log books and small items, as well as providing a convenient shelf on which racks can be placed prior to loading.

SampleGuard®

SampleGuard temperature control, which is optional on HT and Mega systems, protects samples from any possibility of overheating when evaporation is complete, removing the need for time consuming method development. Comprising two thermocouples and a unique sample temperature radio transmitter, SampleGuard provides real time feedback, thus allowing accurate control of actual sample temperatures.

SampleGuard probes can measure temperature at any point in the sample holder. Either one or two probes can be used to accurately and reliably determine end-of-run, enabling the system to be easily set for optimal performance or for setting up LyoSpeed™ methods.



SampleGuard temperature control gives operators peace of mind by protecting samples from overheating when evaporation is complete.

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A wide range of sample holders enable most common formats to be accommodated with ease. The SampleGenie™ system enables large volumes to be concentrated, dried or fast lyophilised directly into the storage vial of your choice.



Sample holders

Genevac evaporators are designed to combine rapid and safe evaporation with high capacity and a wide variety of sample formats. In order to optimise the evaporation performance achieved, it is important to select the correct sample holder for each particular application.

Genevac sample holders are designed to

- *Protect samples from IR radiation damage*
- *Protect samples from overheating*
- *Provide superior heat transfer to samples through close fitting*
- *Protect glassware against breakage*
- *Contain samples in the unlikely event of a tube breakage*
- *Resist aggressive solvent vapours*
- *Withstand g-forces in excess of 500 x g*
- *Prevent imbalance through precise weight matching of paired holders*

One of the major factors determining speed of evaporation is the rate at which heat is transferred to your sample. More heat transferred means faster evaporation. Genevac sample holders are manufactured from high-grade solid aluminium to very precise specifications and are mass balanced to ensure smooth running of the evaporator. Aluminium holders also have particularly efficient heat transfer properties.

To ensure the best heat transfer, Genevac samples holders are manufactured to very close tolerances that ensure tubes fit snugly into the tube holders, avoiding gaps that would slow down the rate of heat transfer. Standard holders are hard anodised for protection against all normal organic solvents, including strong acids such as TFA. When specified for use in an HCl resistant system, steel parts are replaced with titanium to ensure resistance to attack from acid chlorides.

Some of the most popular designs are the FastStack™ microplate holders (which accommodate two deep well or four shallow well plates per rotor position) and the 'side-bridge' swing system, which allows easy loading and quick interchange for a wide variety of tube and vial holders. As the market leader in centrifugal evaporation, we have already designed holders for the majority of applications. However, a special application or unusual tube size can easily be accommodated through a custom holder design on request.

To help eliminate sample reformatting steps, the SampleGenie™ system enables large volumes of up to 200ml to be concentrated, dried or depending on the solvent(s) fast lyophilised directly into the storage vial of your choice.



Unique segmented fraction collector racks enable tubes to be dried straight from the HPLC without further handling and fit Waters, Shimadzu or Gilson fraction collectors.

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Genevac Control Software

HT Series evaporators now feature Version 2 of the successful Genevac Control Software. Enhancements include 'Auto Stop When Dry' allowing safe automatic termination of the method. This is ideal for unattended running and dramatically increases productivity without risking damage to samples or excessive machine wear. Every system arrives with 10 factory installed methods, which suit the majority of solvents or solvent combinations.

Version 2 software confers extra important benefits upon users of the latest Genevac HT Series evaporators:

- *Auto Programming with solvent selection*
- *Auto Stop When Dry*
- *Lyophilisation capability*
- *Post-run graphical display of data*
- *Password protection*
- *Pre-programmed runs to suit a variety of solvents*
- *Optional data logging to external PC*

Auto programming

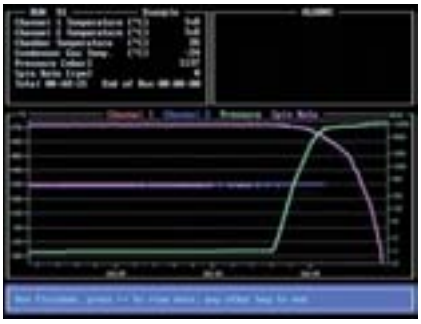
Automatic Solvent Data Selection provides a convenient drop-down table of popular solvents, from which settings can be selected by the full name of the solvent. Once selected, complete solvent data will then be automatically loaded into the run method, making it easy to optimise runs without specialised knowledge. The auto-programmed data will be highlighted on the built-in screen so that method validation can be carried out before executing the run. Programmes can be edited and stored with full 20-character alphanumeric names on the built-in PC for easy identification.

Auto stop

For the first time in a high-throughput machine 'Auto Stop When Dry' is available in method programming. With this option selected, a run will be automatically terminated when the machine detects that the samples are dry. This is achieved with either Heat Flow, which monitors the mean dryness of the whole sample load, or Sample Detection which monitors a specific sample and ends the run when that sample is dry.



Pop up menus make method set up easy with solvent data automatically loaded from factory-programmed files.



A built-in comprehensive display of real-time run data allows easy method development for a wide range of applications. Up to 100 methods, each with a name up to 20 characters, can be stored, making it ideal for multi-user environments.

The system automatically detects when the samples are dry and ends the run. It can then enter low power standby mode, turning off the pump and the condenser. This increases productivity, reduces needless system wear, and can prevent 'overdrying' of more volatile samples. This is ideal for unattended overnight running and dramatically increases productivity without risking damage to samples.

Real time data display

A useful new feature is the post-run display of pressure and temperature in graphical form. This aids QC and allows experienced users to adapt run methods more quickly. In addition, the parameters are displayed in real time during each run.

Auto-Defrost and Drain

The recent introduction of Auto-Defrost & Drain technology to Genevac HT systems permits efficient evaporation of solvent mixtures and enables fast lyophilisation of HPLC fractions. AD&D is only available as a factory fitted option.

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Genevac Condensers – Delivering the power to condense efficiently

Condensers are an extremely important component of any evaporation system. Generally, condensing power is far more important than having the lowest temperature in the condensing pot. Genevac condensers deliver maximum condensing efficiency at all temperatures down to –20°C after which power tails away as the temperature falls towards –50°C, in common with all gas compressor driven refrigeration systems. Genevac evaporators control both the pressure in the evaporator and the condenser temperature to optimise the efficiency of both evaporation and condensation by matching solvent boiling point to the condenser temperature at which full power is available. Therefore, Genevac condensers do not need to reach lower temperatures in order to trap the bulk of the solvent vapour generated. This contrasts with other manufacturers 'cascade' type condensers operating between –50°C and –110°C, which are extremely inefficient at this level and occupy far more precious bench space for an equivalent condensing power.

The VC2300D is a typical Genevac condenser. It consists of a cylindrical vacuum pot with cooling coils connected to a powerful compressor together with a 2.0L vacuum pot. A 0.3L exhaust pot, which runs at atmospheric pressure, is used to condense any residual solvent vapour that passes through the pump. The drain valve empties both the vacuum and exhaust pots simultaneously into a waste container. An optional defrost detector monitors the vacuum pot during the defrost cycle, not only saving time and energy by optimising defrost, but preventing volatile solvents boiling back into the evaporation chamber.

Another option allows solvent flushing of the condenser under instrument control, to prolong working life. The VC2300D is entirely contained within the main body of the HT-4X evaporator, making this our most compact design.

For the larger HT-8 and HT-12 evaporators, an external 3.0L condenser is required. The self contained VC3000D is supplied as standard, and is similar in operation to the VC2300D. Where higher throughput, some degree of automation, mixed solvents or volumes of more than 2.6 litres are to be evaporated, the Auto-Defrost & Drain option is required.

Auto-Defrost & Drain is a factory build option which can be supplied with any HT series evaporator. The evaporation system has full control of the condenser, telling it when to drain during a method, and/or whether to perform a full defrost and drain at the end of the cycle. The functionality of Auto-Defrost & Drain extends far beyond being a fail safe for forgetful moments or extending the operational solvent capacity of your system. Auto-Defrost & Drain permits significant performance improvements in terms of speed, final sample quality, and makes it possible to evaporate diverse mixtures such as DMSO and methanol or carry out the Genevac LyoSpeed method for fast lyophilisation of HPLC fractions.

The HT-24 Evaporation Workstation is equipped with twin VC4000D condensers. These follow a similar design to the VC2300D, but have a larger 4L capacity. Each condenser is connected to a separate evaporation chamber mounted on the service trolley and functions independently. The VC4000D has the additional benefit of semi-automated high power electrical defrost and draining, which reduces downtime due to defrost, and improves evaporation performance. Although the HT-24 uses only one pump, the condensers are separate and can be condensing two different solvents at differing temperatures and pressures simultaneously, with the status of each condenser displayed on the screen of each HT-12 chamber.



There are three models of condenser used with Genevac evaporators:

VC2300D	*Built-in 2.3L condenser on HT-4X.*
VC3000D	*External 3.0L condenser for HT-8 and HT-12.*
VC4000D	*Built-in 4.0L condenser for HT-24, used in pairs.*

All the condensers shown above can be upgraded with Auto-Defrost & Drain technology.

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Choosing the right Vacuum Pump for your Genevac HT System

With many years experience in the field of vacuum pump design, Genevac has concluded that modern dry-pump technology offers the best technological solution to most of the problems associated with pumping common solvent vapours.

Our Scroll pump design is based on an oil-free technology developed in conjunction with a leading pump manufacturer to meet the exacting requirements of life sciences research. It can continuously pump organic solvent vapours, including TFA, without any maintenance or oil changes associated with older pump designs. The manufacturers recommend special precautions when used in conjunction with ammonia or hydrogen chloride.

There are two versions available: The VCS-5 Scroll Pump has a flow rate of 5m^3/hour and is suitable for use with HT-4X, HT-8 and HT-12. With our larger HT-24 systems we recommend the VCS-10 Scroll Pump with an increased flow rate of 10 m^3/hour. These rugged pumps feature heavy gauge aluminium construction and smart styling and are surprisingly quiet in operation, with low heat emission. The compact VCS-10 will also fit snugly into the pump compartment of our revolutionary HT-24 Evaporation Workstation.

The unique Genevac Vacuum Control Unit (VCU) is an integral part of our Scroll Pump system. The VCU ensures that the pump is correctly slaved to the evaporator and only delivers vacuum pull-down when required to maintain or achieve the set chamber pressure. In addition, pump vapour purge and initial pump warm up operations, which are essential for smooth operation and long pump life, are controlled by the evaporator through the VCU. The VCU technology is an important part of the Dri-Pure anti-bumping system, allowing for a smooth vacuum ramp down to the desired pressure. All Genevac Scroll Pumps are supplied complete with an appropriate VCU.



The HT-24 service trolley comes equipped with an VCS-10 scroll pump.



The Genevac scroll pump with integrated vacuum control unit (VCU).

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Technical data	HT-4X	HT-8	HT-12	HT-24
Mechanical data				
Max rotor speed	1300 Standard	1300 Standard	1300 Standard	1300 Standard
	1730 Dri-Pure	1800 Dri-Pure	1800 Dri-Pure	1800 Dri-Pure
Max Force (G)	300-500	300-500	300-500	300-500
Drive system	Direct	Direct	Direct	Direct
Operation imbalance (g)	85	85	85	85
Max load (Kg)	4 x 1.5 @ 500 x g	8 x 1.5 @ 500 x g	12 x 1.5 @ 500 x g	24 x 1.5 @ 500 x g
IR lamps number	2	4	6	12
Weight (Kg)	118	153	180	700
Condenser				
Condenser temperature (°C)	Minimum -50	Minimum -50	Minimum -50	Minimum -45
	Maximum +60	Maximum +60	Maximum +60	Maximum +60
Vacuum condenser capacity (litres)	2.3	3.0	3.0	2 x 4.5
Exhaust condenser capacity (litres)	0.4	1.5	1.5	2 x 1.0
Condenser chamber	316 Stainless steel	316 Stainless steel	316 Stainless steel	316 Stainless steel
Condenser drain valve	Stainless steel /PTFE	Stainless steel /PTFE	Stainless steel /PTFE	Stainless steel /PTFE
Vacuum system				
Pressure display/ resolution (mbar)	0-1200	0-1200	0-1200	0-1200
Vacuum control	0 mbar-atm	0 mbar-atm	0 mbar-atm	0 mbar-atm
Dri-Pure available	Yes	Yes	Yes	Yes
Auto vacuum vent valve	Yes	Yes	Yes	Yes
Ultimate system vacuum (mbar)	0.4	0.4	0.4	0.4
Scroll Vacuum pump				
Weight (Kg)	28	28	28	Included
Maximum vacuum (mbar)	0.15 (50Hz)	0.15 (50Hz)	0.15 (50Hz)	0.15 (50Hz)
	0.12 (60Hz)	0.12 (60Hz)	0.12 (60Hz)	0.12 (60Hz)
Dimensions				
Evaporator (mm)	590x640x590	562x700x660	562x700x828	1346x712x1660
Evaporator Lid Open (mm)	590x640x980	Not applicable	Not applicable	Not applicable
Condenser (mm)	Built-in	515 x 590 x 425	515 x 590 x 425	Built-in
Scroll Pump (mm)	530 x 305 x 398	530 x 305 x 398	530 x 305 x 398	Built-in
Electrical				
Power supply	230V, 50Hz, single phase, 10A	230V, 50Hz, single phase, 13A, 5A	230V, 50Hz, single phase, 10A x 2	230V, 50Hz, single phase, 13A x 3
	208V, 60 Hz, single phase, 10A	208V, 60 Hz, single phase, 10A, 5A	208V, 60 Hz, single phase, 9A 10A x 2	208V, 60 Hz, single phase, 15A x 3

All specifications are subject to change without notice.

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Selecting the right system for your application

With such a wide range of systems and available options it is important to ensure that you get the right evaporator for your application. These notes present some of the common considerations; for expert advice on matching your system selection to your application please consult your local Genevac sales person or distributor.

Sample Throughput

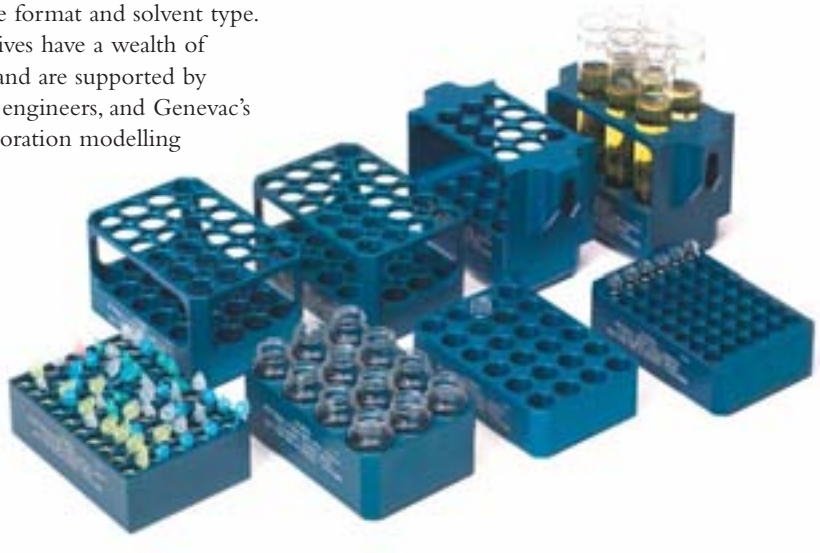
All Genevac HT Series evaporators have broadly the same features, but differ in their capacity to hold samples. The larger machines give the same great performance as our bench top HT-4X system, but can handle many more samples in each run. Whilst this is an important factor when working out how much capacity you will need, speed of evaporation is equally significant. Genevac HT Series evaporators are faster than any other comparable systems in their class with like-for-like solvents, thanks to high power lamps, accurate temperature control, efficient pump and a powerful condenser. With some solvents they can be as much as three times faster. This means you can dry down more samples in a working day without having to buy a bigger machine. Genevac achieves greater throughput by optimising your evaporation capacity and drying speed. This can save valuable lab space and make your budget stretch further. Genevac representatives are able to advise on throughput of systems, for a given sample format and solvent type. Representatives have a wealth of experience and are supported by applications engineers, and Genevac's unique evaporation modelling software.

Sample Size and Format

To help you get the best from your investment, Genevac HT evaporators are designed to be as flexible as possible and have an extensive range of available sample holders. All Genevac sample holders are designed for maximum protection of samples and fastest drying times, see the section on sample holders for more details. Genevac can accommodate many different sample formats:

1. *All SBS standard microplates and any reaction blocks, tube holders or racks having a microplate-sized footprint. This includes microplates, both deep-well and shallow-well from Axygen, Greiner, Nunc, Corning Costar, Perkin Elmer Packard, Polyfiltronics, Multichem, Uniplates and tube racks by Micronics, ABGene and Matrix*
2. *Tubes up to 152 mm maximum length and 40mm maximum diameter*
3. *Vials from 8 to 28 mm diameter including 1 and 2 Dram and 4ml HPLC vials, 20ml and 40ml scintillation vials and bottles.*
4. *Round-bottom flasks from 25ml to 250ml capacity (not Mega systems)*
5. *Genevac Segmented Fraction Collector Blocks for Waters, Shimadzu or Gilson fraction collectors; typically three or four blocks per rack*
6. *SampleGenie holders with 60ml, 125ml or 200ml capacity can be supplied to fit most small storage vials*

All of the above items can be fitted to our HT-4X, -8, -12 and -24 systems.



Within our range there are many off-the-shelf holders for the most common applications. Holders are also available to special order for specific applications not covered by the standard range.

Solvents you will use

Solvent selection is crucial to the throughput that you can expect from a Genevac evaporator. Solvents that evaporate slowly or have high boiling points like DMSO and NMP or anomalous physical characteristics, such as water, will tend to slow down drying and reduce throughput. Because of their advanced technology even the slowest drying solvents dry more rapidly in a Genevac system than a similarly sized competitive system.

In some chemistries, an organic modifier is needed, and in others TFA or HCl are used for cleavage. Whilst all standard Genevac evaporators can handle TFA in any quantity, even small traces of HCl could damage a standard system. In this case a special HCl-resistant HT-4X or HT-12 should be ordered. This is capable of withstanding prolonged exposure to high concentrations of HCl and other acid chlorides that would rapidly damage a standard evaporator. Only Genevac can offer large-scale evaporation in a proven HCl-proof system, we strongly recommend doing a side by side trial of a Genevac HCl-proof system with any other manufacturers system to prove this.

Some volatile solvents with low auto-ignition points require the use of an inert purge box. This system maintains an inert nitrogen atmosphere above the samples during spin up and spin down reducing the risk from explosive air/solvent mixtures, which may exist for short periods in the chamber. It is mandatory for use with di-ethyl ether.

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Genevac HT Series evaporator options guide

1. Select the appropriate capacity unit

You will need to discuss this with your salesperson, however these figures will be useful as a guide to how many samples can be accommodated in one run. Remember, Genevac HT Series II evaporators achieve fast drying times, therefore, several runs per day may be possible, depending on solvents in use and sample formats.

	HT-4X	HT-8	HT-12	HT-24
Deep well microplate	8	16	24	48
50ml Flasks	16	32	48	96
1 dram vials	96	192	288	576
16 x 100mm tubes	96	192	288	576

2. Select the options needed for your application

	HT-4X	HT-8	HT-12	HT-24
Dri-Pure	✓	✓	✓	✓
Sample Guard	✓	✓	✓	✓
Remote Door unlock	✓	✓	✓	✓
HCl Resistant	✓	–	✓	–
Defrost Probe	✓	–	–	✓
Inert Gas Purge	✓	✓	✓	–
Condenser Flusher	✓	✓	✓	✓
High Power lamps	✓	✓	✓	✓
Auto-Defrost & Drain	✓	✓	✓	✓
Maximum pump flow rate	5m³/hr	5m³/hr	5 or 10m³/hr	10m³/hr

Standard feature included in system price ✓ *Optional feature at extra cost* ✓

Notes on these options:

HT-12 units normally require only a 5m3/hr flow rate pump, but if you wish to upgrade to HT-24 standard at a later date, at least one of the HT-12 units should be equipped with a 10m3/hr pump. All machines are available in a choice of 230V 50Hz or 208V 60Hz and are supplied as standard with a swing rotor. Swing rotors can accept either open or side-bridge swings, which must be specified separately, together with the sample holders to be used. Some holders do not require swings at all, such sample holders fit directly into the rotor. Please consult your Genevac salesperson or our on-line Accessories & Sample Holders Brochure for the latest selection and details of holder and swing compatibility, which can be found at ***www.genevac.com***

HT-8 & HT-12 systems require an auto draining condenser if the total solvent load is likely to be greater than 2.6 litres per run. Additionally, there are some solvent combinations where drying times can be significantly improved if auto drain is used, your sales person will advise you of these. All systems require a Defrost Detector where the system will be used with more than 20% TFA solutions.

A range of trolleys and fume hoods to complement your Genevac evaporator are also available, please ask your sales representative for details..

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Service and support

Genevac is dedicated to providing cost-effective solutions to your evaporation problems that will give you reliable service over many years. All of our equipment is manufactured to strict quality standards and is fully inspected before delivery to your laboratory.

Genevac recognises that by choosing our centrifugal evaporation technology for your solvent removal needs you are investing both capital and resources. Our customer support programme is designed to help you protect the value of your investment by prolonging the useable life of the equipment and maximising system performance & up-time in your laboratory.

Qualified, factory-trained service personnel who are often experts in the science of evaporation maintain all Genevac systems worldwide. Operating from major service centres in Europe and the USA our network of Customer Support engineers is there to help you get maximum up-time from your Genevac system, to optimise the system performance, conduct IQ/OQ and, if required, provide quality training for your staff.

A range of service contracts is available to suit your budget and the size of your installation, please contact us for details of the available options.

For larger installations of Genevac equipment it may be advisable to have your own engineers or technicians trained to provide first-line service diagnostics and repairs. Please discuss whether this would benefit your organisation with our Service Managers at the New York or Ipswich offices, or with your local distributor.



EZ-2 Personal Evaporator

If your application, workload or budget won't allow you to purchase one of our HT Series machines, why not consider our lower cost benchtop evaporator – the EZ-2?

It is compact, robust and easy to use. Smart styling combined with a simple user interface and wide range of sample holders for the two-position rotor make the EZ-2 the instrument of choice for the smaller laboratory and for small workgroups in bigger labs.

The EZ-2 Personal Solvent evaporator has a built-in cold trap and pump and is capable of removing solvents with boiling points up to 155°C with ease. What's more, a low-cost upgrade enables this versatile instrument to work with acid chlorides, including HCl, indefinitely. Request a full descriptive brochure on the EZ-2 from the Genevac website: **www.genevac.com**



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Request your copy of these two Genevac brochures, '*Rocket Evaporator*' and '*EZ-2 Personal Solvent Evaporator*', which give full details of these exciting products at **www.genevac.com**.

Genevac – an SP Industries brand

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HT Series Evaporators RevB 10-1588.

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