Quorum

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GloQube® Plus
Instruction Manual

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Issue	Date	Details	Revised By
1	01/08/19	First issue	SRM
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3	19/08/20	Registered Office, COSHH and Conformity edits	SRM

Disclaimer

The components and packages described in this document are mutually compatible and guaranteed to meet or exceed the published performance specifications. No performance guarantees, however, can be given in circumstances where these component packages are used in conjunction with equipment supplied by companies other than Quorum Technologies Ltd.

Contents

Section Contents

List of Figures

List of Tables

Health and Safety

Safety is very important when using any instrumentation. At Quorum, we endeavour to:

- Provide a safe working environment for our employees and customers
- Conduct our business responsibly, in a manner designed to protect the health and safety of customers, employees and the public at large, and to minimise any adverse effects on the environment.
- Review our operations regularly to achieve environmental, health and safety improvements in line with UK and European Community legislation.

All service work carried out on the equipment should only be undertaken by suitably qualified personnel.

Quorum is not liable for any damage, injury or consequential loss resulting from servicing by unqualified personnel. Quorum will also not be liable for damage, injury or consequential loss resulting from incorrect operation of the instrument or modification of the instrument.

If this equipment is not used in accordance with this instruction manual, the safety protection provided by the equipment may be impaired.

Control of Substances Hazardous to Health (COSHH)

The EU legislation regarding the "Control of Substances Hazardous to Health" requires Quorum to monitor and assess every substance entering or leaving their premises. Consequently, a completed Health and Safety Declaration form must accompany any returned goods (see Appendix 8.4.5 on page 52 for the form).

Without this declaration, Quorum reserves the right not to handle the substance/item. Also, in accordance with EU regulations, we will supply on request hazard data sheets for substances used in our instruments.

WEEE Compliance

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC.

For full details of our environmental policies, including WEEE, please visit http://www.quorumtech.com/about-us/environmental-policy.html.

Conformity

This Equipment of this design and manufacture and marked CE, conforms with the requirements of the European LVD and EMC Directives (see Declaration of Conformity for details).

Quality

Quorum Technologies Ltd operates a quality management system in accordance with ISO 9001.

Certificate No: 3698/03

Fail Safe

This Equipment will "fail safe" in the presence of excessive RF, Electrostatic Discharge or Mains Transients. While a loss of function could occur under extreme circumstances, the Equipment's operation will be fully recoverable under normal operating conditions.

Intended Use

This instrument is designed for laboratory use only and is not intended for use in a production environment.

Lifting the System

The GloQube Plus has a weight of 19.5kg – care should be taken when lifting the equipment. The system should be carried using both hands on the underside of the GloQube Plus. Do not use the handle on the door to lift the GloQube Plus. Adopt a stable position, keep the equipment close to your waist while lifting, taking care not to bend your back.

Hazard Warnings

Potential hazards are described in notes using the following key words:

WARNING *Potentially* hazardous situation or unsafe practice that, if not avoided, *could* result in death or severe injury.

CAUTION *Potentially* hazardous situation or unsafe practice that, if not avoided, may result in minor or moderate injury or damage to equipment.

In addition, GHS (Globally Harmonized System of Classification and Labelling of Chemicals) pictograms are included in this manual to indicate when a procedure involves the use of hazardous chemicals. These symbols may also be present on equipment and containers.


GHS01
Explosive


GHS02
Flammable


GHS03
Oxidising


GHS04
Gas Under Pressure


GHS05
Corrosive


GHS06
Acute Toxic


GHS07
Harmful / Irritant / Skin Sensitiser


GHS08
Carcinigen / Germ cell mutagen / Reproductive toxin


GHS09
Hazardous to the aquatic environment

If the chemical is a severe hazard, the label on its container includes the signal word 'Danger'; in case of less severe hazards, the signal word is 'Warning'.

WARNING!

Wear gloves at all times. If using chemicals which may be harmful wear appropriate protective clothing.

We recommend that all reagent preparation is carried out in a fume hood.

When using hazardous chemicals, the rotary pump's outlet should be connected to an appropriate exhaust system.

1 Introduction

This manual covers the installation and operation of the GloQube® Plus dual chamber, glow discharge system. The system is designed to provide a surface charge modification treatment of coated TEM (Transmission Electron Microscopy) support grids, tapes and other substrates using air, methanol or pentylamine/alkylamine. It is designed to modify the surface charge to change a surface to being hydrophilic or hydrophobic.

1.1 Basic Overview of the System

The GloQube Plus is of a dual chamber design, with touchscreen control and dedicated firmware. The left-hand "clean" chamber is designed for applications requiring hydrophobic-hydrophilic conversion, typically using air as the process gas. The right-hand "vapour" chamber is designed for use with reagents such as methanol and amylamine and, with operator safety firmly in mind introduces the required vapour using reusable septum-sealed reagent vials. Loading and removing reagents is convenient and reliable: the vial is located in its holder and inserted into a shielded needle using a bayonet fitting.

Figure 1-1. Overview of the system

1.2 Introduction to Glow Discharge

1.2.1 Background

Glow discharge in a reduced atmosphere of air has been the commonly accepted method to render carbon support films for electron microscopy (EM) hydrophilic (i.e. with a net negative charge) prior to adsorbing suspensions of biological material on to the surface. In other words, to convert naturally hydrophobic ('water-hating') carbon-coated transmission electron microscopy (TEM) support grids into a hydrophilic ('water-loving') condition. As mentioned, this is usually performed in a vacuum chamber and by placing the coated grid between two parallel electrode plates to which a high voltage is applied a glow discharge (plasma) is formed. The vacuum need not be high: backing vacuum from a rotary pump is more than sufficient.

Glow discharges are sometimes considered to be 'imperfect' plasmas and cannot be used to plasma etch or plasma ash specimens, their use mainly being confined to altering surface energies, not the removal of bulk material.

The glow discharge process traditionally takes place in a reduced atmosphere of air, but by using other vapours such as methanol or amylamine a different surface modification effect can be achieved. A charged surface property can be used as a positive advantage.

1.2.2 Importance for Electron Microscopy

Why are these properties important for electron microscopists?

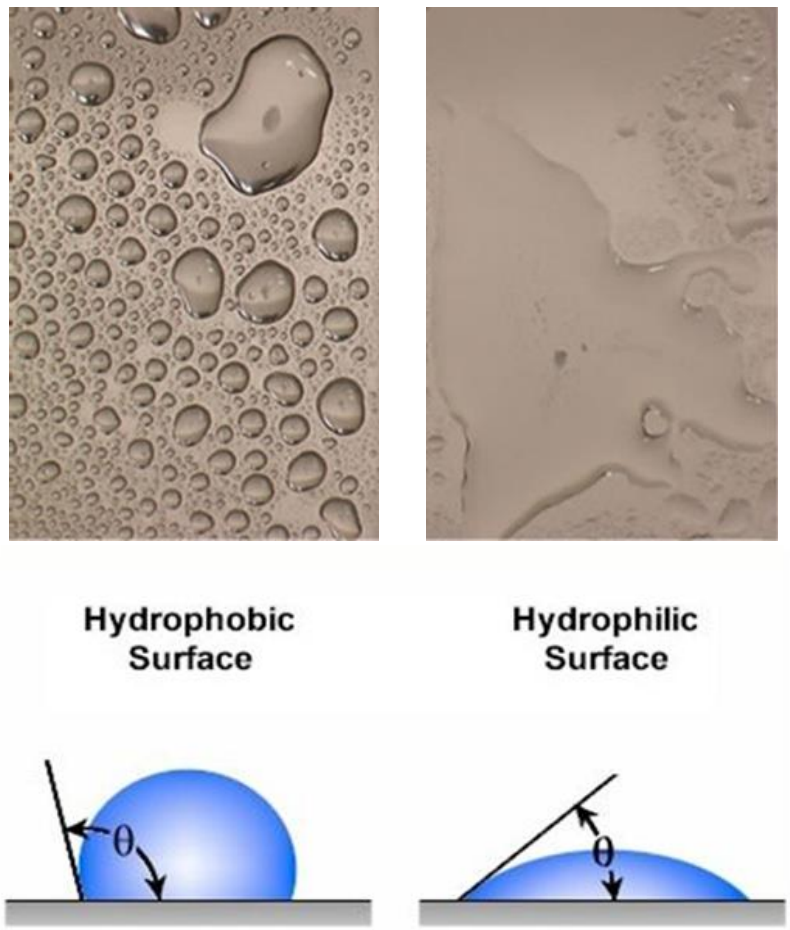
Samples (viruses, nano-particles, cells etc.) are commonly in the form of a suspension dispersed on a TEM grid accompanying some sort of support film (i.e. formvar/carbon). The support film, when produced, usually has a variable, charged surface. Evaporated carbon film is naturally hydrophobic, but not uniformly so, therefore the “spreading” of the suspension is very difficult.

1.2.3 Hydrophobicity and Hydrophilicity

Hydrophobicity is the physical property of a molecule (known as a hydrophobe) that is ostensibly “repelled” from a mass of water. In reality there is no repulsive force involved; it is actually an absence of attraction. Hydrophobic molecules tend to be non-polar and, thus, prefer other neutral molecules and non-polar solvents. Hydrophobic molecules in water often cluster together, forming micelles. Water on hydrophobic surfaces will exhibit quite a high contact angle (Figure 1-2). In short, an aqueous solution has to be “forced” to come into contact with a hydrophobic (non-polar) surface.

Figure 1-2. Hydrophobic surface – large contact angle

The closer that the contact angle (θ) is to 0°, the better is the degree of hydrophilicity.



Contact Angle, θ	**High**	**Low**
Adhesiveness	**Poor**	**Good**
Wettability	**Poor**	**High**

Figure 1-3. Hydrophobic and hydrophilic surface

In contrast to a hydrophobic surface, water and liquid spreads very easily on a hydrophilic surface and the contact angle, θ, is much lower.

1.2.4 Glow Discharge in Air – Hydrophilic

The standard method of glow discharge to render carbon support films and other surfaces hydrophilic is to conduct the process in a vacuum with a reduced volume of leaked in air and with the polarity of the source at a positive voltage.

The product of this process provides a surface that is on the whole hydrophilic with a net negative charge. The surface does not undergo significant modification other than a change of charge and the effect is not permanent. This treatment of the film avoids aggregation of particles at the grid square boundaries when the sample droplet is applied.

1.2.5 Glow Discharge with Hydrocarbons – Hydrophobic

A carbon film treated in a reduced atmosphere of hydrocarbon, usually methanol, with the polarity of the source at a positive voltage, produces a hydrophobic surface. As with the air only treatment this effect is not a permanent one.

Positively charged macromolecules such as ferritin and cytochrome c family of proteins (associated with the inner membrane of mitochondria) adsorb strongly.

1.2.6 Glow Discharge with Alkyl Amines – Hydrophobic

Alkylamines, for example amylamine, are known to form positively charged, hydrophobic films on carbon surfaces in glow discharge processes with the polarity of the source at a negative voltage.

Such films attract negatively charged areas of macro molecules allowing for the desired orientation to be observed. The coating's resulting hydrophobicity also helps to retain the molecules on the surface as the core of proteins is usually also hydrophobic. This amylamine vapour can also deposit on the chamber walls, and this is why it is recommended to have both a 'clean chamber' and a 'vapour chamber' to prevent cross contamination.

Clean chamber label (left side)

Vapour chamber label (right side)

Figure 1-4. Chamber designation labels

This glow discharge process was first reported by Dubochet et al[1] to assist in adhering nucleic acids to a carbon film. This process is also suitable for other negatively charged macromolecules for example proteins and antibodies.

In published literature you will often find contradictory information about the hydrophobicity of films glow-discharged in this way, some say that it makes the surface hydrophilic, others hydrophobic.

1.2.7 Glow Discharge with Magnesium Acetate – Hydrophilic

A positively charged hydrophilic film is the one type of film that cannot be obtained using glow discharge alone. However, this can be partially overcome by glow discharge in air with the polarity of the source at a negative voltage followed by post treatment with a 5 mM solution of magnesium acetate. The negative charges of the hydrophilic surface are neutralised by the Mg^{++} ions from the solution. Another simple way is by using 0.1 % (w/v) polylysine solution after the glow-discharge. This procedure is suitable for DNA molecule suspensions on grids, or for AFM using substrates of freshly cleaved mica or HOPG (Highly Ordered Pyrolitic Graphite).

[1] Dubochet, Jacques, et al. "A new preparation method for dark-field electron microscopy of biomacromolecules." Journal of ultrastructure research 35.1-2 (1971): 147-167.

1.2.8 Summary

- Evaporated carbon support film is naturally hydrophobic
- Most specimens have better adhesion to a hydrophilic surface
- Surfaces can be made either hydrophilic or hydrophobic
- Surfaces can be positive or negative

The desired effect of glow discharge is to make the surface of the TEM grid carbon support sufficiently charged and appropriately modified for the application. As a result a thin liquid film, in which the sample is suspended, will evenly spread and dry over the entire surface. The following table lists examples of possible surface modifications along with their applications.

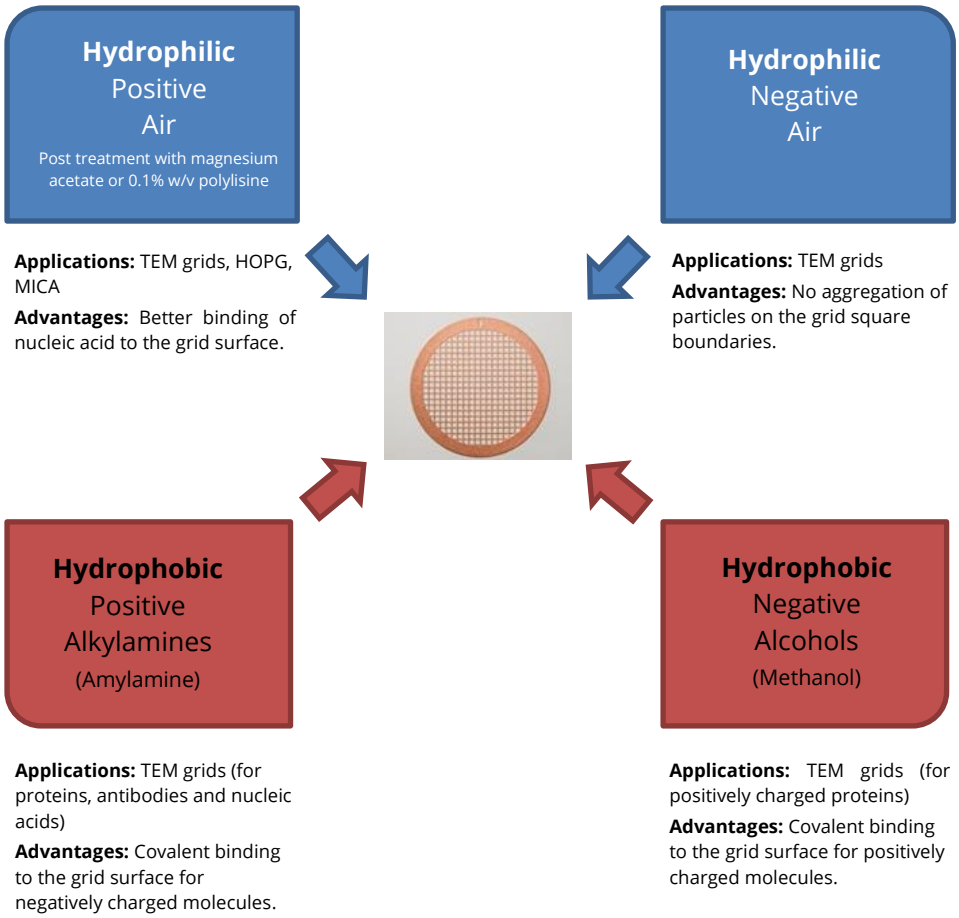


Figure 1-5. Glow discharge applications

2 Installation

The system is bench-mounted and may be positioned in any convenient space ensuring that the On/Off switch is readily accessible to the user. A single mains socket is required for power. The rotary pump can be positioned behind the GloQube Plus and takes its power from the main instrument.

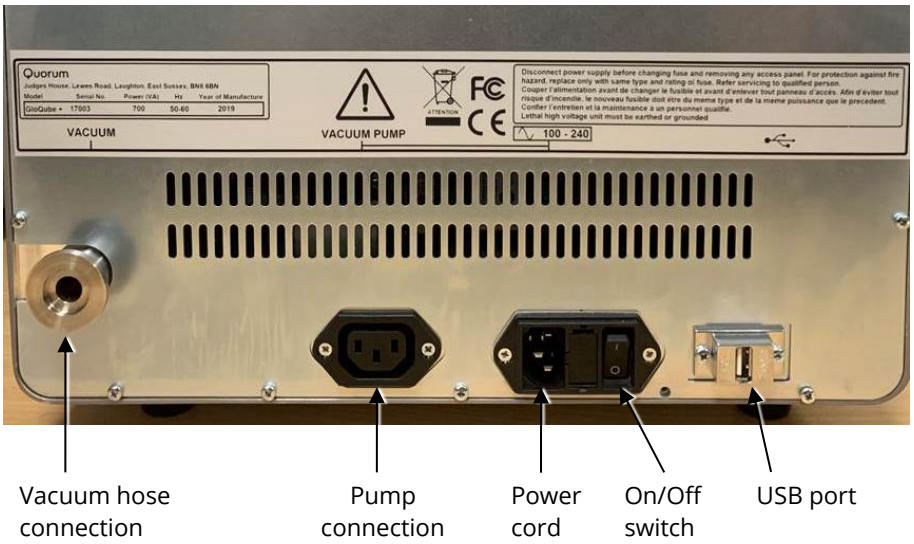


Figure 2-1. Back panel connections

2.1 Connecting the Rotary Pump and Power Cords

This section describes how to fill the rotary pump with oil, connect the oil mist filter, connect the vacuum hose to the GloQube Plus and connect the electrical power cords.

2.1.1 Filling the Pump with Oil

To fill the rotary pump with oil:

1. Remove the red screw cap on the top of the pump.
2. Insert a small funnel to assist in filling with oil.
3. Carefully pour in the oil from the 1 litre bottle provided (Part number 13233).
4. Fill to approximately 1 cm below the full mark.
5. Replace red screw cap.

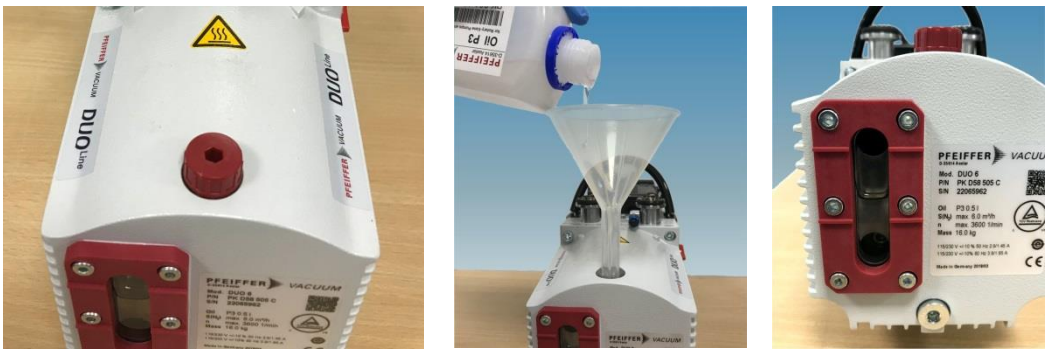


Figure 2-2. Filling the rotary pump with oil
(left) Red screw cap on top of rotary pump
(centre) Filling the pump with oil
(right) Oil level gauge on side of pump

2.1.2 Connecting the Oil Mist Filter

CAUTION!

When using hazardous chemicals, the rotary pump's outlet should be connected to an appropriate exhaust system and the oil mist filter should be removed.

1. Screw the blue oil mist filter (07803) in to the aluminium filter carrier
2. Using the KF 16 clamp provided, clamp the filter and carrier onto the outlet side of the rotary pump (marked with ↓) making sure that the mesh filter and 'O' ring carrier are in situ.

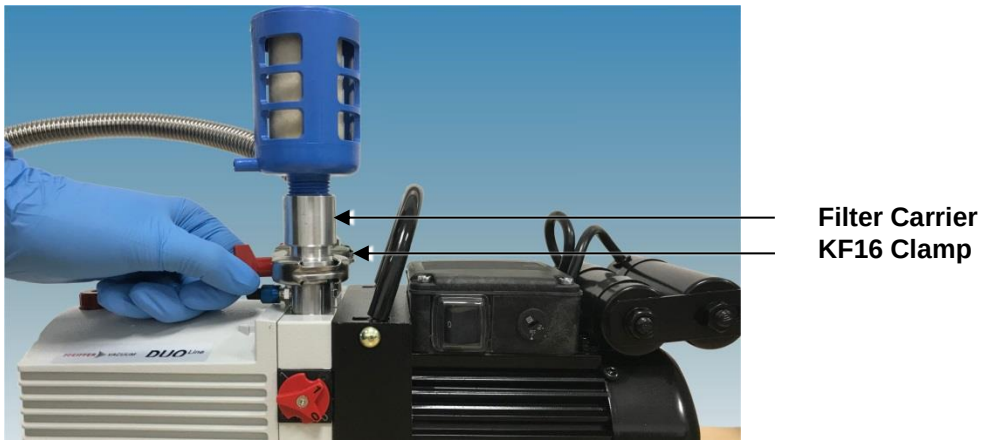


Figure 2-3. Rotary pump – oil filter connection

2.1.3 Connecting the Stainless Steel Vacuum Hose

1. Using the KF 16 clamp and 'O' ring carrier provided, attach the stainless steel vacuum hose to the unit as shown in Figure 2-4.
2. Connect the other end of the hose to the inlet side of the vacuum pump (↑) using the KF 16 clamp and 'O' ring carrier/filter provided (Figure 2-4).

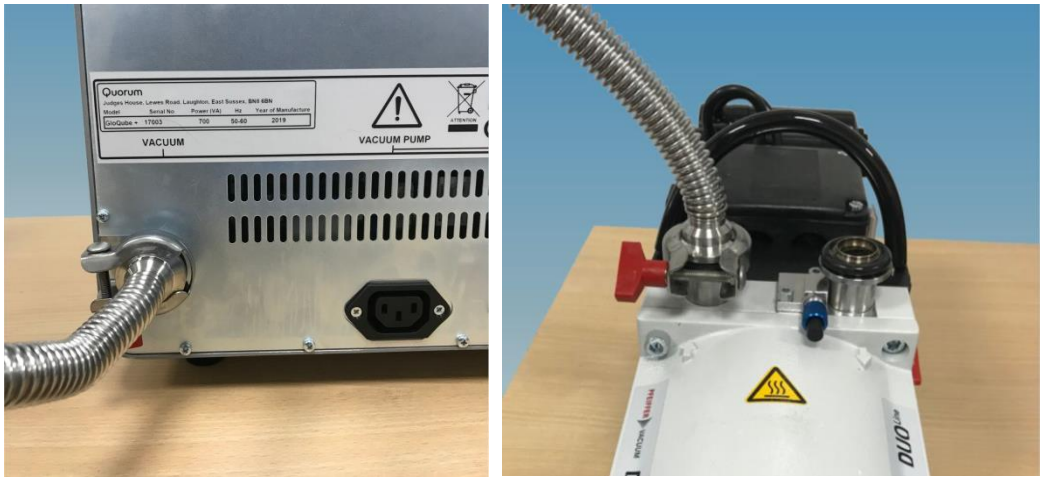


Figure 2-4. Vacuum hose connection to (left) GloQube Plus and (right) rotary pump

2.1.4 Connecting the Power Cords

CAUTION!

This equipment must only be used with an earthed mains supply. It should only be used with the mains lead supplied with the equipment.

1. Take the power cord with the mains plug and connect to the power in socket next to the on/off switch (See Figure 2-1 for location). Plug the other end into a suitable mains socket (do not switch on yet).
2. Take the other double-ended lead and plug one end into the pump and the other into the back of the GloQube Plus (this is identified as “pump connection” in Figure 2-1).
3. Check that the voltage switch is set to the correct voltage for your country and then switch on the pump (Figure 2-5).

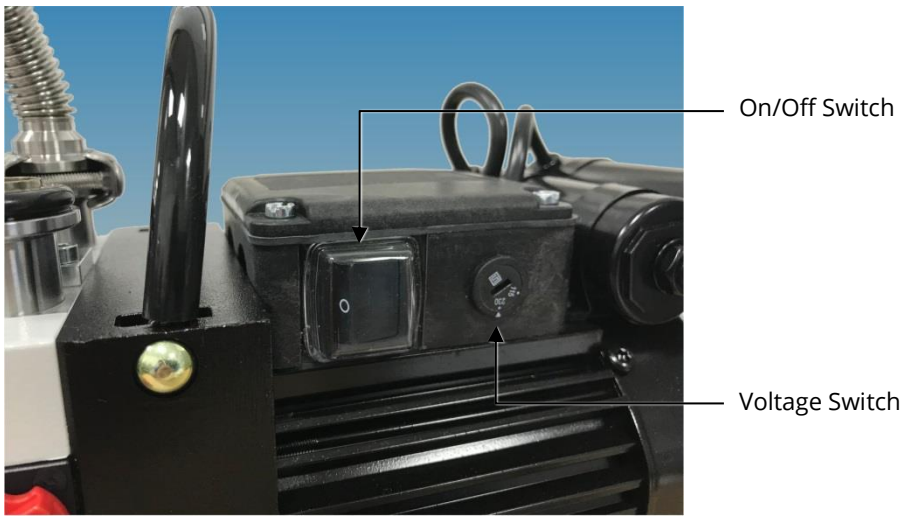


Figure 2-5. Rotary pump

The unit should now look as in Figure 2-6 below.

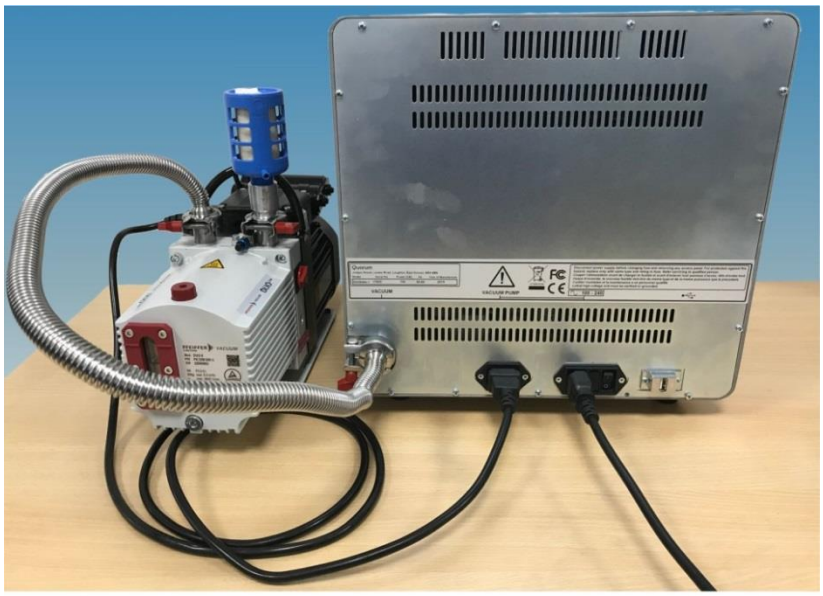


Figure 2-6. Fully connected

2.2 Filling and Installing the Vapour Injection System

The vapour injection system is made up of a glass vial which is sealed by a septum. As the vial is loaded into the injection system housing the septum is pierced by a hypodermic needle. The needle is covered by a shutter which opens as the vial is rotated preventing any risk of injury to the user (See Figure 2-7).

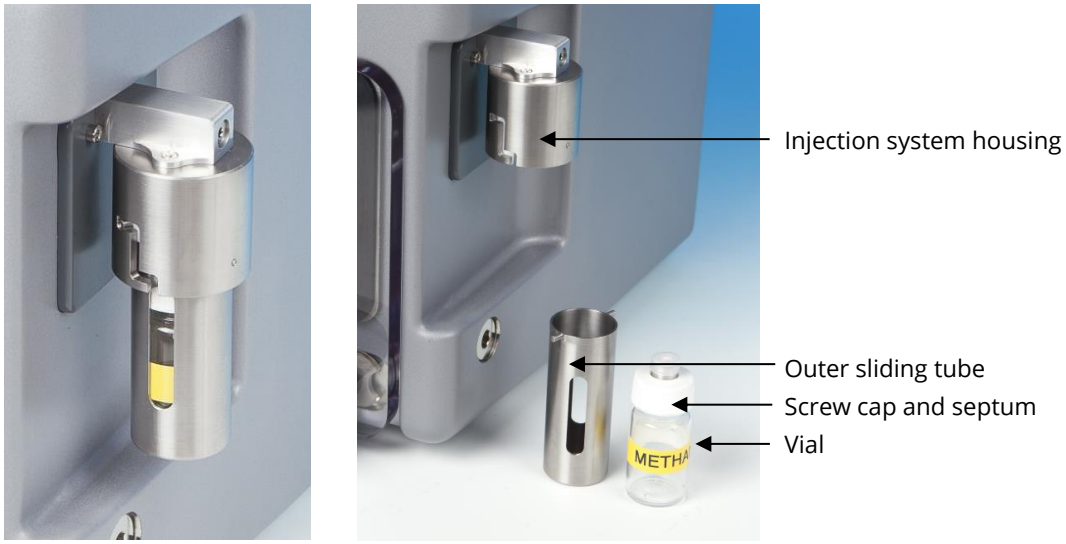


Figure 2-7. Injection system: (left) installed; (right) main components

2.2.1 Filling the Vial

DANGER!

It is recommended that the vial be filled in a fume hood. It should only be filled to about half of its volume. Observe normal safety precautions for the liquid being used. If in doubt, consult your local health and safety representative and conduct your own risk assessment. Once the vial is filled and sealed it can then be placed inside the outer sliding tube ready for fitting to the GloQube Plus.

2.2.2 Fitting the Screw Cap and Septum

The cap for the vial is made up of the following components:

- Protective cap
- Septum
- Screw cap
- Metal spacer (This is not a consumable)
- Cap seal
- Vial

These are assembled in the order shown in Figure 2-8.

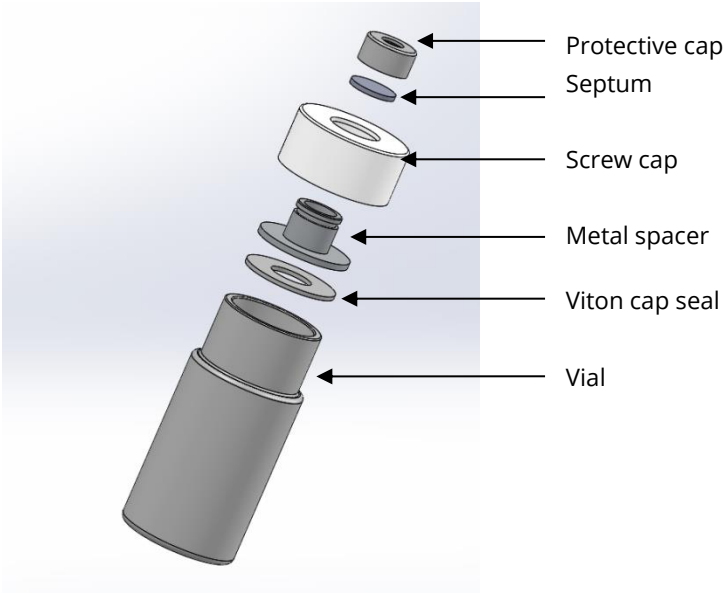


Figure 2-8. Vial components

These components are available as a consumable pack (less the metal spacer) see Section 7.6 (page 43).

2.2.3 Loading the Vial

To insert a vial:

1. Locate the two lugs (Figure 2-9) on the outer sliding tube into the corresponding slots in the injection system housing.
2. Press the sliding tube upwards, rotate clockwise, press up again and once more rotate clockwise to lock in place (See Figure 2-10).

To remove a vial, simply rotate it anti-clockwise and the spring loading will push the outer sliding tube downwards.

Figure 2-9. Locating lugs

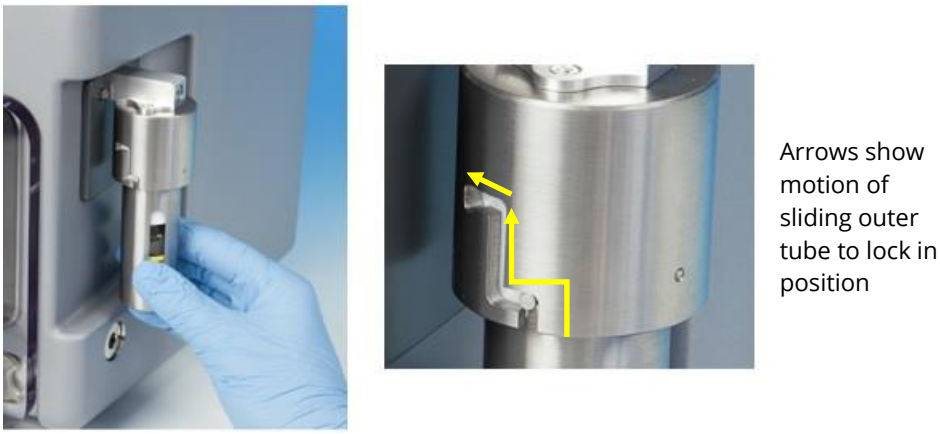


Figure 2-10. Injector mounting

2.2.4 Loading the Samples

Each chamber of the GloQube Plus is fitted with a tray for supporting samples (See Figure 2-11).

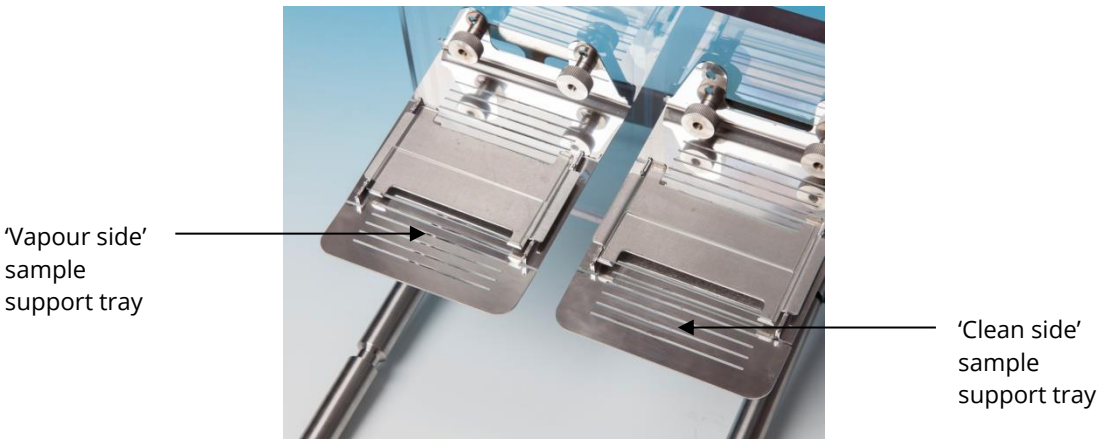


Figure 2-11. Sample support trays

To load samples:

1. Vent the GloQube Plus and the slide the door open.
2. Normally, for TEM grids, glass microscope slides or TEM grid holders are used to load the grids. Each tray can accommodate two standard 3" x 1" slides or one grid holder. Place the grids onto the slide(s) making sure they are well spaced.
3. Transfer the slide(s) to the selected tray ('clean' or 'vapour' side) as shown in Figure 2-11.
4. Carefully, close the door so as not to disturb the grids.
5. Run the chosen treatment profile.

Other samples or grid holders (Part No. 28273) can be placed directly on the trays and treated in the same way.

3 Operation

This chapter describes the basic operation of the GloQube Plus. For more advanced use, please see below and ***Application Guidelines*** on page 26.

3.1 Switching On for the First Time

1. Ensure that you have completed the installation as described in the previous sections.
2. Switch the instrument on using the rocker switch located on the rear panel. The front panel LCD display should illuminate and show the initialising message.
3. Once the instrument hardware and software has initialised, the *Home* screen is displayed (see Figure 3-1).

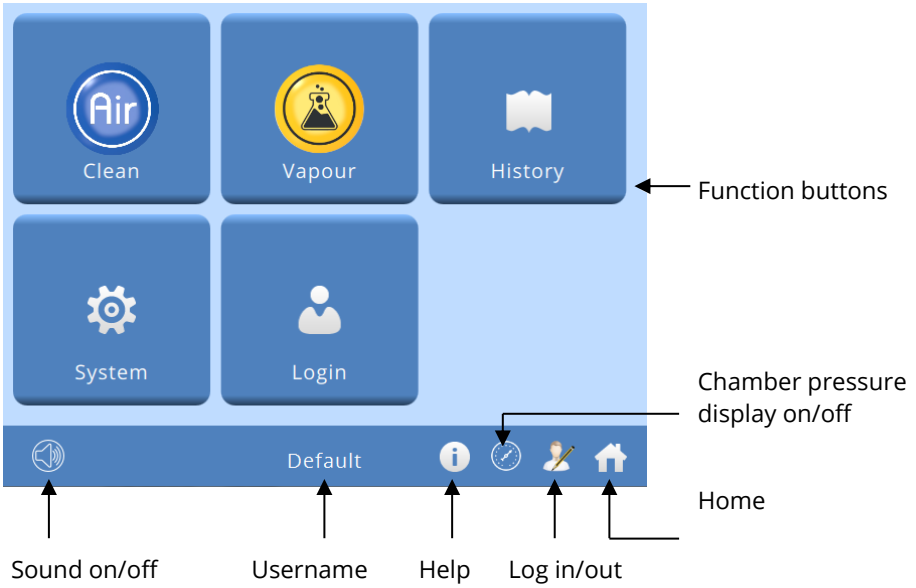


Figure 3-1. Home screen

3.2 The Home Screen

The Home screen has five function buttons:

- Clean (see Section 3.3)
- Vapour (see Section 3.3)
- History (see page 38)
- System (see page 29)
- Login (see page 34)

The menu bar has buttons for commonly used task such as logging in/out, accessing the online Help system, and returning to the *Home* screen.

The chamber pressure button toggles the pumping/vacuum information display across the bottom of the screen (as shown in Figure 3-3). This consists of Clean and Vapour chamber pressure bar graphs and pressure readings.

3.3 Running a Recipe

To run a Clean or Vapour recipe:

1. Load your sample onto the centre of the appropriate sample tray in either the Clean or Vapour chamber.
2. Close the front door.
3. Tap on the **Clean** or **Vapour** button as appropriate (see Figure 3-1).

Figure 3-2. (left) Clean and (right) Vapour recipes

4. The GloQube Plus has default recipes for common Clean and Vapour tasks as shown in Table 1 (see page 22). Tap on the name of the recipe you want to run (you may need to scroll down the list to find it).

> *Recipes ready to run are listed at the top and are ordered according to how often they are used.*

5. Tap on  . The GloQube Plus starts pumping the sample chamber. The progress of the run is shown through a series of on-screen messages.

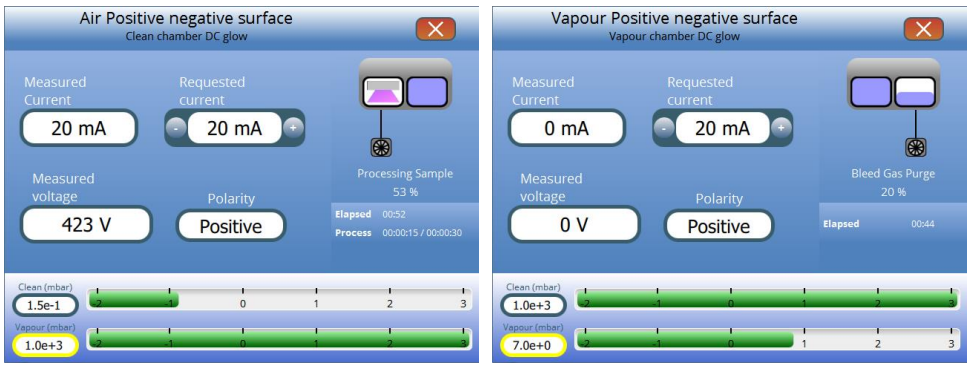


Figure 3-3. A run in progress: Clean (left) and Vapour (right)

6. If you want to stop a run while it is in progress, tap on  .

7. At the completion of the run, the GloQube Plus vents the chamber. Full details of the run are logged in the instrument's **History** – see page 38).

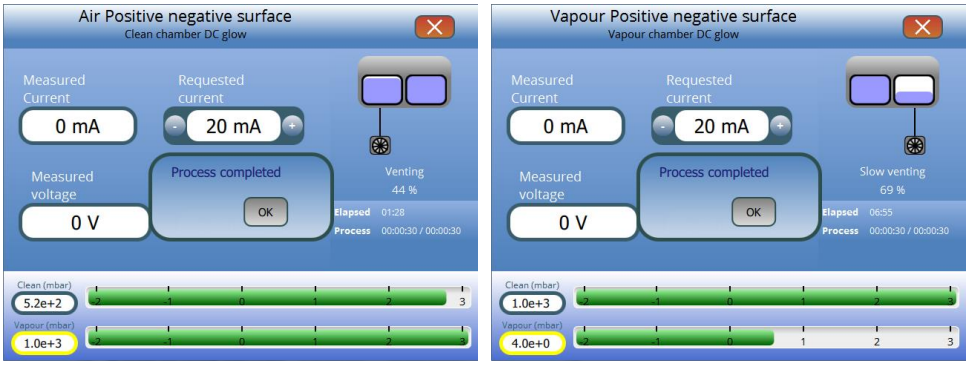


Figure 3-4. Completed Clean (left) and Vapour (right) processes.

8. Click on the **OK** button to return to the Clean or Vapour recipes screen. You can now remove your sample and set up another run.

4 Working with Recipes

The operation of the GloQube Plus is controlled by a recipe. This describes the sequence of operations in glow discharge cycles. You can also create recipes to carry out simple operations such as venting the sample chamber. Many of the basic operations such as pumping, outgassing or venting the chamber occur automatically as does the sequence in which they occur.

The GloQube Plus is supplied with several default recipes to perform the most common operations.

Table 1 Clean Recipes

RECIPE NAME	PURPOSE
Air Negative positive surface Clean chamber DC glow	Create hydrophilic surface for positive sample surface
Air Positive negative surface Clean chamber DC glow	Create hydrophilic surface for negative sample surface
Vent Clean chamber Vent Clean chamber	Vent Clean chamber only
Vent both chambers Vent both chambers	Vent both the Clean and Vapour chambers

Table 2 Vapour Recipes

RECIPE NAME	PURPOSE
Amylamine Vapour chamber DC glow	Create hydrophobic positive sample surface
IPA Flush Vapour chamber DC glow	Clean the vapour manifold after running the amylamine process
Vapour Positive negative surface Vapour chamber DC glow	Create a negative surface - vapour dependent
Vapour Negative positive surface Vapour chamber DC glow	Create a positive surface - vapour dependent
Methanol negative surface Vapour chamber DC glow	Create hydrophobic negative sample surface
Vent both chambers Vent both chambers	Vent both the Clean and Vapour chambers
Vent Vapour chamber Vent Vapour chamber	Vent Vapour chamber only

To customise recipes for your own applications, you can:

- Create a new recipe
- Edit an existing recipe
- Make a copy of an existing recipe
- Rename an existing recipe
- Delete a recipe

4.1.1 Creating a New Recipe

To create a new recipe:

1. From the *Home* screen, tap on the **Clean** or **Vapour** button. The appropriate recipes screen is displayed (see Figure 3-2).
2. Tap on  . The *Choose Process Type* screen is displayed (see Figure 4-1).

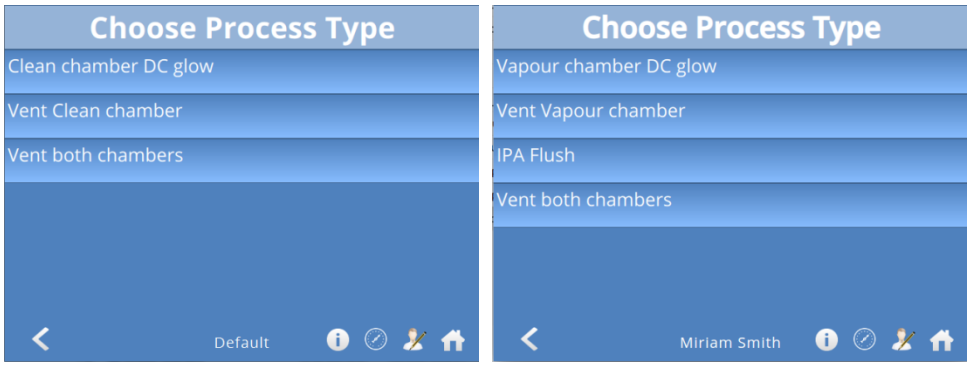


Figure 4-1. Creating a new Clean recipe (left) or Vapour recipe (right)

3. Choose the type of process, for example, **Clean chamber DC glow**.
4. Enter a name for the recipe using the on-screen keyboard.

Figure 4-2. Entering a new recipe name

5. Tap on the **Enter** button to confirm the recipe name. Alternatively, tap on  to close the screen without creating a new recipe.
6. The new recipe is created using the default settings for the chosen process type.
7. Now refer to the next section (*Editing Recipe Parameters*).

4.1.2 Editing Recipe Parameters

1. To edit a recipe from the *Recipes* screen, tap on the symbol alongside its name. The recipe's properties are displayed. If you have just created a new recipe, this screen is displayed after you have entered a name.

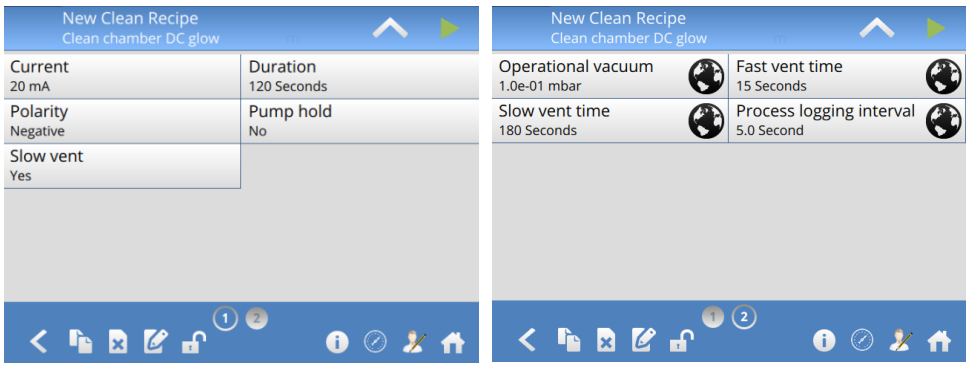


Figure 4-3. Recipe Parameters

2. Properties are displayed across two pages. Tap on the numbered buttons to move between the paged screens. The first page lists the properties that define and control the recipe type. The second page lists the default system parameters (see page 34) that are applied to the recipe.
3. To edit a parameter, for example **Current**, tap on it.

> *If a parameter is shown in grey text, you do not have the necessary user privileges to edit it. See page 32 for details.*

4. Change the value using the onscreen keypad. Note that the screen shows the allowed values for the parameter.
5. Tap on the **Confirm** button to apply the change or on the **Cancel** button to restore the previous value.

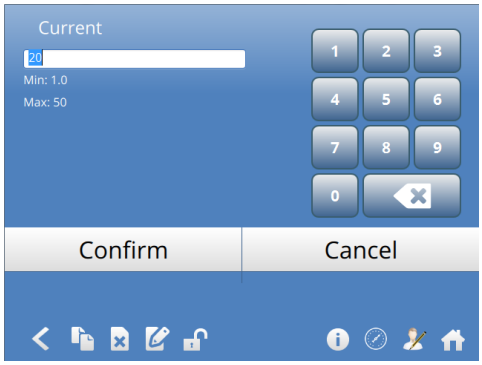


Figure 4-4. Editing the Current Recipe Parameter

6. Edit other parameters as required.
7. Tap on to return to the recipes list or on to display the *Home* screen.

To see a list of the parameters used in recipes see Section 8.1, page 46.

4.1.3 Copying a Recipe

To copy an existing recipe:

1. From the *Recipes* screen, tap on the symbol alongside the recipe's name
2. Tap on  .
3. Click on the **OK** button to confirm the action.

A copy of the recipe is created with the name "copy_<recipe name>". You may now want to rename (see below) and edit the recipe.

4.1.4 Renaming a Recipe

To rename an existing recipe:

1. From the *Recipes* screen, tap on the symbol alongside the recipe's name
2. Tap on  . Use the onscreen keyboard to type a new name for the recipe.
3. Click on the **OK** button to confirm the action.

The recipe is renamed in the recipe list.

4.1.5 Deleting a Recipe

To delete an existing recipe:

1. From the *Recipes* screen, tap on the symbol alongside the recipe's name
2. Tap on  .
3. Click on the **OK** button to confirm the action.

The recipe is deleted.

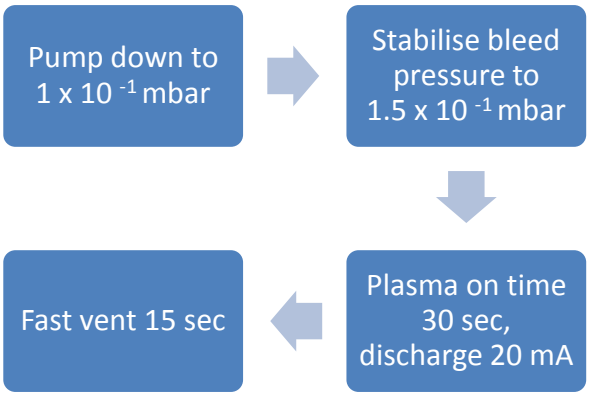
5 Application Guidelines

This section describes the standard recipes and their typical applications.

5.1 Air: Clean Chamber/Vapour Chamber

Creates Hydrophilic Surface.

Source Polarity: Negative
Positive

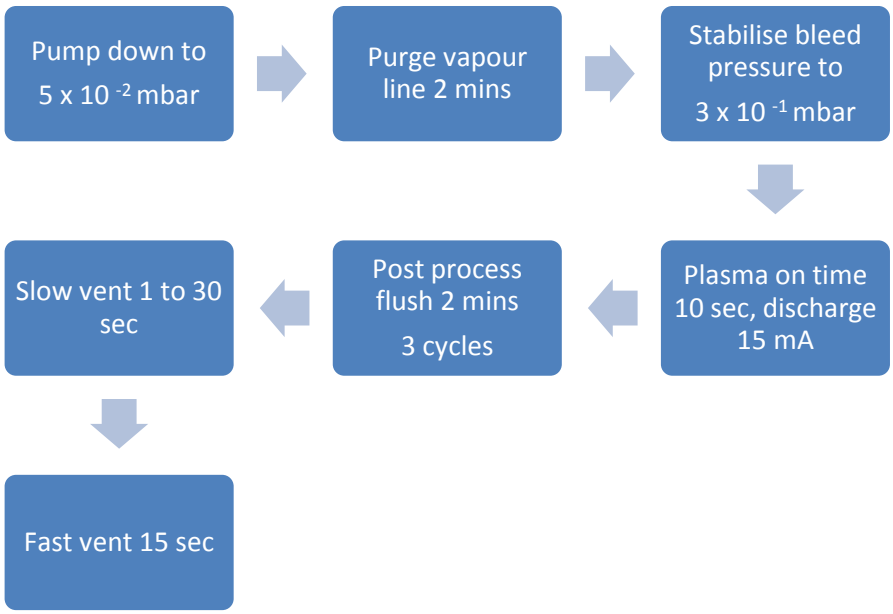


5.2 Amylamine: Vapour Chamber

DANGER!

Creates Hydrophobic Positive Surface.

Source Polarity: Negative

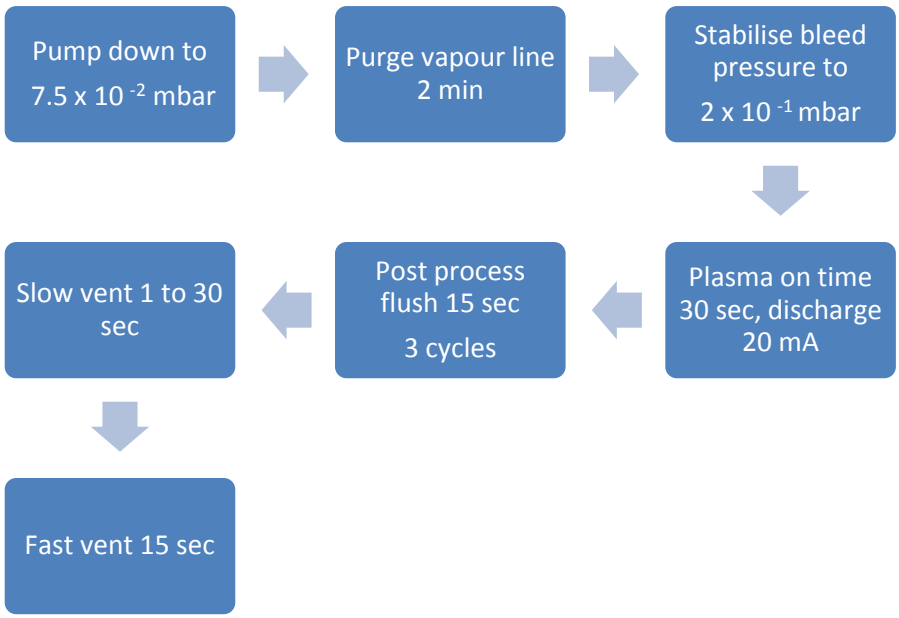


5.3 Methanol: Vapour Chamber

DANGER!

Creates Hydrophobic Negative Surface

Source Polarity: Positive



5.4 Isopropanol

DANGER!

Used for clean cycle on Vapour chamber bleed valve when amines used or chemical change in the Vapour chamber.

Source Polarity: Negative

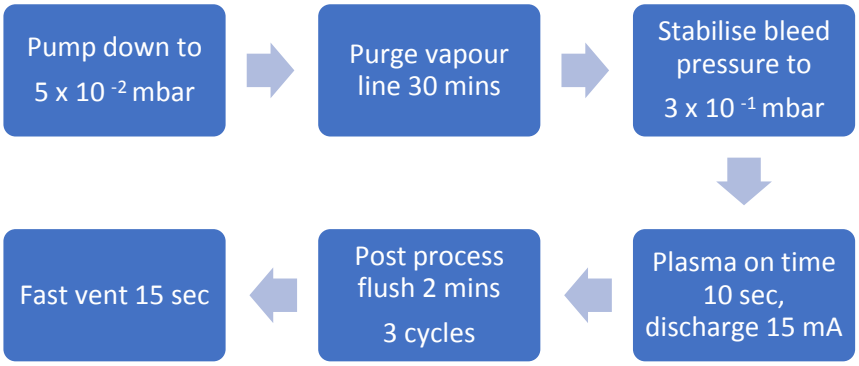


Table 3 Available recipe settings

Current	1 to 50 mA	Notes
Duration (Of plasma)	1 to 900 sec	
Flush cycles	1 to 5	Number of Post Process Flush Cycles
Post Process Flush Time	1 to 600 sec	Including Pump-down and Flush Time for each 1 min
Bleed Gas Purge Duration	30 to 300 sec	Time the gas line and vapour above the fluid in the bottle is pumped to remove air
Repeat Cycles	1 to 500	Repeat of entire recipe
Bleed Time Out	0 to 90 sec	Time allowed for gas stabilisation
Bleed Vacuum	0.01 to 1 mbar	Vacuum that the bleed valve allows gas into the vacuum
Operational Vacuum	0.01 to 1 mbar	Vacuum that the recipe waits to achieve before starting process
Fast Vent	1 to 30 sec	If activated, slow vent occurs before fast vent
Slow Vent	1 to 300 sec	To reduce venting affecting movement of light substrates. if activated slow vent occurs before fast vent
Process Log Interval	0.5 to 60 sec	Data logging frequency

6 Instrument Settings

The specific operation of the GloQube Plus is determined by the settings of the active recipe. Default settings and general hardware settings are configured through the *System* menu. This section describes how you can:

- Adjust the date and time
- Change general instrument settings
- Create user accounts

Tap on **System** on the *Home* screen (see Figure 6-1).

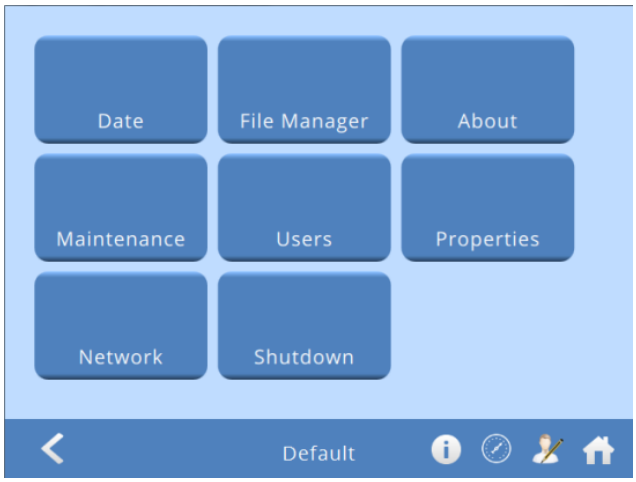


Figure 6-1. System screen

The *System* screen displays the categories available at your privilege level.

Table 4 GloQube Plus System options

Option	Pages	Purpose
Date		Set the instrument clock (see page 30)
File Manager		Backup or restore* instrument files such as recipes and processing data (see page 30)
About		View version information about the operating software (see page 30)
Maintenance		View usage and service information (see page 31)
Users		Create, edit or delete user accounts (see page 32)
Properties	**Page 1***	Edit gas bleed parameters and cleaning times and cycles (see page 35)
	Page 2*	Edit pumping parameters (see page 36)
	Page 3*	Service and cleaning reminders (see page 37)
Shutdown		Shut system down

** Admin group level required to edit these properties*

6.1.1 Date

Use this option to set the date and time used by the instrument (see Figure 6-2).

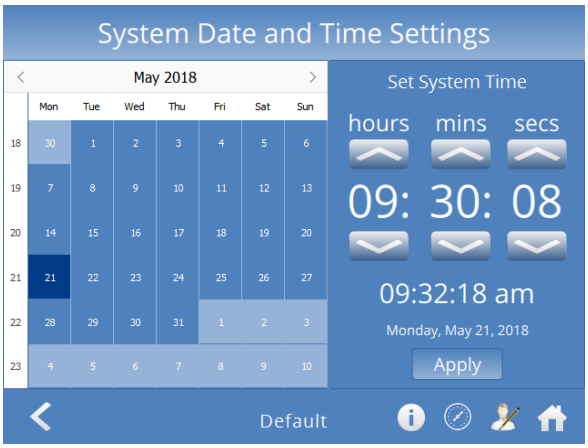


Figure 6-2. System date and time settings

6.1.2 File Manager

File Manager (see Figure 6-3) allows all users to back up process log files and recipes to a USB device or another location on the network. Users with administrator level privileges (see page 32) can also:

- Restore data from a previously saved backup
- Update the operating software
- Use *File Manager* to copy all log files (see below)
- Use *File Manager* to selectively copy, move or delete files (see below)

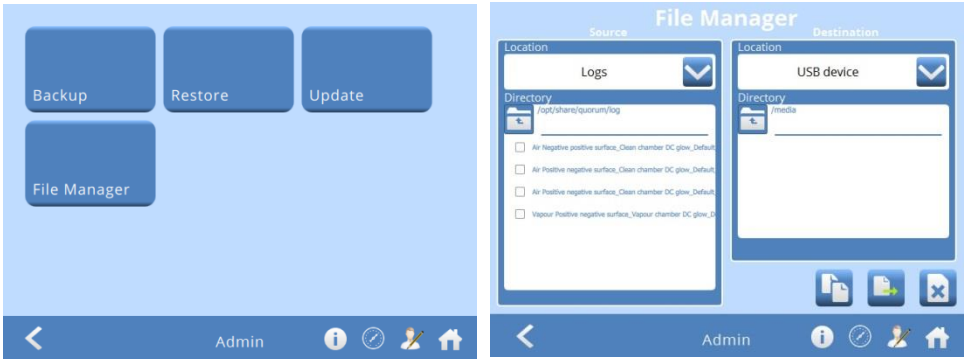


Figure 6-3. File Manager (general users have access to Backup option only)

Downloading all files

To download the process logs:

1. Insert a USB stick in the USB socket on the rear of the GloQube Plus (see Figure 2-1).
2. From the *Home* screen, tap on **System > File Manager > Backup**.
3. Select **Logs** from the *Backup type* box.
4. Tap on the **Backup** button.

Log files are compressed into a .tgz file.

Selective download

To download one or more log files:

1. Insert a USB stick in the USB socket on the rear of the GloQube Plus (see Figure 2-1).
2. Log in using an Administrator account.
3. From the *Home* screen, tap on **System > File Manager > File Manager**.
4. Browse to the appropriate directory and select the required log files.
5. Select the destination directory on the USB stick.
6. Choose one of the following options:

    Copy the files to the USB stick.

    Move the files to the USB stick (they will no longer be present in the GloQube Plus log directory).

Log files can be viewed in a text editor such as Notepad.

6.1.3 About

The *About* screen shows version information about the operating software: the installation date and version number, and also details about the firmware installed for internal processor boards. You may be asked for this information during any calls with technical support.

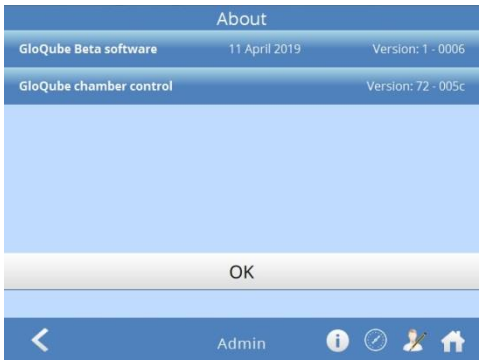


Figure 6-4. About screen

6.1.4 Maintenance

The *Maintenance* screen shows usage information and is updated by the service engineer:

- Operation time
- Serviced on
- Chamber cleaned on
- Processing done since last clean

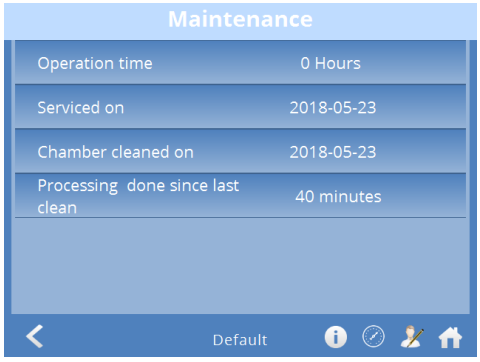


Figure 6-5. Maintenance screen

6.2 User Management

The GloQube Plus software employs a user account system with individual login names and passwords. Registered users are granted access privileges at a *group* level.

Student is the lowest privilege level and is not password protected. At this level, a user can run the instrument and create or edit recipes but cannot change any settings. It is also possible to register users with *student* privileges.

Default is for general users and is password protected. At this level, a user can run the instrument and create or edit recipes. It is also possible to register users with *student* or *default* privileges. A *default* user has additional access to vacuum and hardware settings.

Admin is password protected. In this level, it is possible to edit a number of hardware settings. It is also possible to register users with *admin*, *student* or *default* privileges. With *admin* privileges, a user can edit many of the settings.

Some system properties can only be accessed with additional privileges. Contact Quorum for details.

When first switched on, the GloQube Plus starts in the default startup user account (see *Default User, 6.2.5*).

6.2.1 Adding a User

To create a new user account:

1. From the *Home* screen, tap on the **System** button.
2. Tap on the **Users** button. The *Edit Users screen* is displayed (see Figure 6-6).
3. Tap on  . The *Edit User Details* screen is displayed.
4. Tap on the **Username** text box and use the on-screen keyboard to type the name for the user..
5. Select the privilege level for the new user from the **Level** dropdown list.
6. Tap on the **Full Name** text box and use the on-screen keyboard to type the full name of the user..
7. Tap on the **Password** text box and use the on-screen keyboard to type a password for the user's account.
8. Repeat the password in the **Confirm Password** text box and tap on the Enter button.
9. Tap on the **Save** button to create the user account. Alternatively, tap on the **Cancel** button to close the on-screen keyboard without creating the account and return to the *Edit Users* screen.
10. The *Edit Users* screen is displayed. Register further users as required.
11. Tap on  to return to the *System Properties* screen or  to return to the *Home* screen.

6.2.2 Editing a User

To edit an existing user account:

1. From the *Home* screen, tap on the **System** button.
2. Tap on the **Users** button. The *Edit Users* screen is displayed (see Figure 6-6).
3. Tap on the username of the account you want to edit. The *Edit User Details* screen is displayed.
4. Edit the **Username, Level,** or **Fullname** as required.
5. To change the Password associated with the account, tap on the **Edit password** button. You will be required to enter to the existing password to be able to enter a new password.
6. Tap on the **Save** button to confirm the user account. Alternatively, tap on the **Cancel** button to discard any changes and return to the *Edit Users* screen.
7. The *Edit Users* screen is displayed. Edit further users as required.
8. Tap on  to return to the *System Properties* screen or  to return to the *Home* screen.
9.

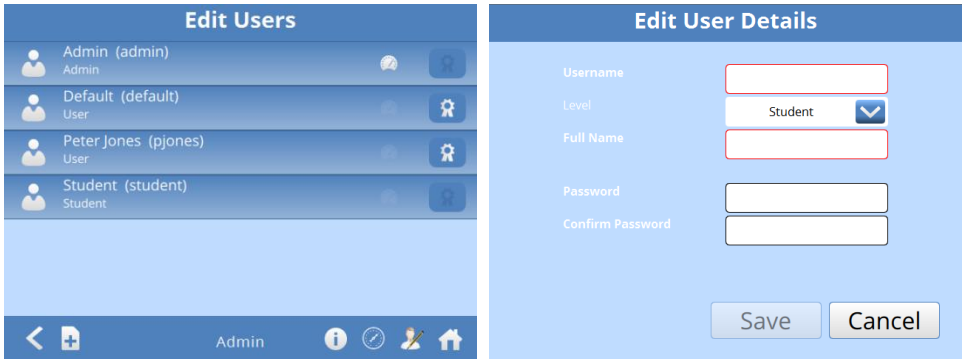


Figure 6-6. Creating/editing a user

6.2.3 Deleting a User Account

To delete an existing user account:

1. From the *Home* screen, tap on the **System** button.
2. Tap on the **Users** button. The *Edit Users* screen is displayed (see Figure 6-6).
3. Tap on the username of the account you want to delete. The *Edit User Details* screen is displayed.
4. Tap on the **Delete** button.
5. The *Edit Users* screen is displayed.
6. Tap on  to return to the *System Properties* screen or  to return to the *Home* screen.

6.2.4 Login

To log in as a different user:

- From the *Home* screen, tap on the **Login** button.
- From elsewhere in the software, tap on  .

The *Change User* screen is displayed. Use the on-screen keyboard to type your username and password and then tap on the **Enter** button.

Figure 6-7. Change User screen

6.2.5 Default User

To select the user account active when the instrument is switched on:

1. From the *Home* screen, tap on the **System** button.
2. Tap on the **Users** button. The *Edit Users screen* is displayed (see Figure 6-6).
3. Tap on the 'rosette' icon  next to the user profile you want to load when the instrument is first switched on.
4. Tap on  to return to the *System Properties* screen or  to return to the *Home* screen.

6.3 Properties

The specific operation of the GloQube Plus is determined by the settings of the active recipe. However, the default and general hardware settings are configured through the *System Properties* menu.

Some parameters are specified at a system level, but can be overridden in the recipe. For example bleed pressure can be set and this overrides the system default bleed pressure. Within properties, all parameters that are currently active are indicated by a "Global" icon. If this icon is crossed out in red, it indicates that the default value has been overridden in the active recipe.

6.3.1 Page 1

These are the default settings used during glow discharge sequences. The GloQube Plus uses these settings in all recipes.

To change the settings, tap **System** on the *Home* screen and then **Properties**. The *System Properties* screen consists of three pages.

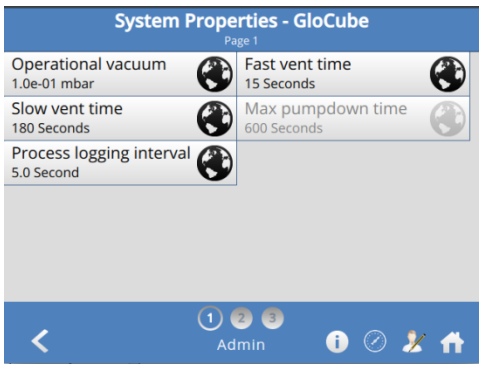


Figure 6-8. System Properties, page 1 (admin mode)

Table 5 System properties, page 1

Name	Default Value	Minimum Value	Maximum Value	Comment
Operational Vacuum (mbar)*	$1x10^{-1}$	$1x10^{-2}$	1.0	Vacuum level that must be reached before discharge commences
Fast vent time (s)	15	1	30	
Slow vent time (s)	Yes	1	300	
Max pumpdown time (s)**	600	60	600	
Process logging interval (s)*	5	0.5	60	

** Admin group level required to edit this property*

*** Engineer (or higher) privileges required to edit this property*

1. To edit a parameter, tap on its value.
2. Change the value as required.
3. When you edit a value, tap on the **Confirm** button to accept the change or on the **Cancel** button to restore the previous value.
4. Edit other parameters as required.
5. Tap on  to return to the *System Properties* screen or  to return to the *Home* screen.

6.3.2 Page 2

These are the default settings for pumping/venting cycles used in glow discharge sequences. The GloQube Plus uses these settings in all recipes.

To change the settings, tap **System** on the *Home* screen and then **Properties**. To display the list, tap on the "2" button.

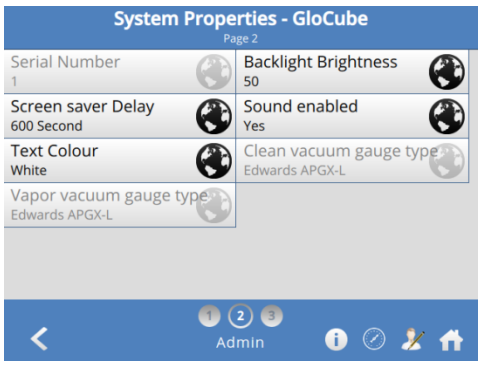


Figure 6-9. System Properties, page 2 (admin mode)

Table 6 System properties, page 2

Name	Default Value	Minimum Value	Maximum Value	Comment
Serial Number**				*Read only:* identification code for instrument
Backlight Brightness	50	1	100	Screen brightness
Screen saver Delay (s)*	600	1	100000	Period of instrument activity before screensaver is displayed
Sound enabled	Yes	No	Yes	Wait time before process begins
Text Colour	White			
Clean vacuum gauge type **				*Read only:* displays installed gauge type on clean chamber
Vapor vacuum gauge type **				*Read only:* displays installed gauge type on vapour chamber

** Admin group level required to edit this property*

*** Engineer (or higher) privileges required to edit this property*

1. To edit a parameter, tap on its value (you may need to scroll down the screen to see all the properties)
2. Change the value as required.
3. When you edit a value, tap on the **Confirm** button to accept the change or on the **Cancel** button to restore the previous value.
4. Edit other parameters as required.
5. Tap on  to return to the *System Properties* screen or  to return to the *Home* screen.

6.3.3 Page 3

These settings define the configuration of your instrument. The GloQube Plus uses these settings in all recipes.

To change the settings, tap **System** on the *Home* screen and then **Properties**. The *System Properties* screen consists of three pages; *Hardware Parameters* are displayed on the third page (see Figure 6-10 and Table 7).

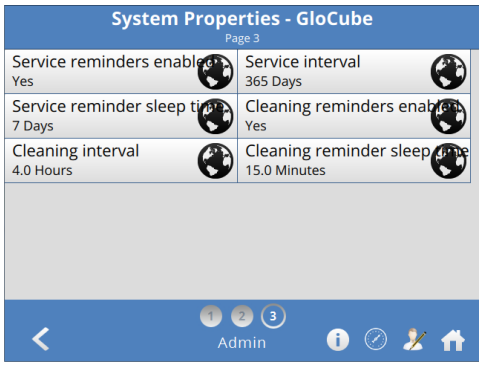


Figure 6-10. System Properties, page 3 (admin mode)

1. To edit a parameter, tap on its value (you may need to scroll down the screen to see all the properties)
2. Change the value as required.
3. When you edit a value, tap on the **Confirm** button to accept the change or on the **Cancel** button to restore the previous value.
4. Edit other parameters as required.
5. Tap on to return to the *System Properties* screen or to return to the *Home* screen.

Table 7 System properties, page 3

Name	Default Value	Minimum Value	Maximum Value	Comment
Service reminders enabled *	Yes	No	Yes	Enable or disable on-screen reminders for instrument service schedule
Service reminder sleep time (days) *	7	1	180	Time interval between service reminders when set interval has been exceeded
Cleaning interval (hrs) *	4	0.0167	60	Operational time interval between cleaning reminders
Service interval (days) *	365	1	730	Recommended interval between GloQube Plus services by Quorum engineer
Cleaning reminders enabled *	Yes	No	Yes	Enable or disable on-screen reminders for instrument cleaning
Cleaning reminder sleep time (min) *	15	1	120	Time interval between cleaning reminders when set interval has been exceeded

** Admin group level required to edit this property*
*** Engineer (or higher) privileges required to edit this property*

6.3.4 Shutdown

Tap on this option to shut down the instrument.

6.4 History

To view the process log, listing information about the recipes run on the GloQube Plus:

1. From the *Home* screen (see Figure 3-1), tap on **History**.
2. The *Process History* screen is displayed (see Figure 6-11). Process events are listed in order with the most recent at the top of the list. You may need to scroll down the list to see earlier events.

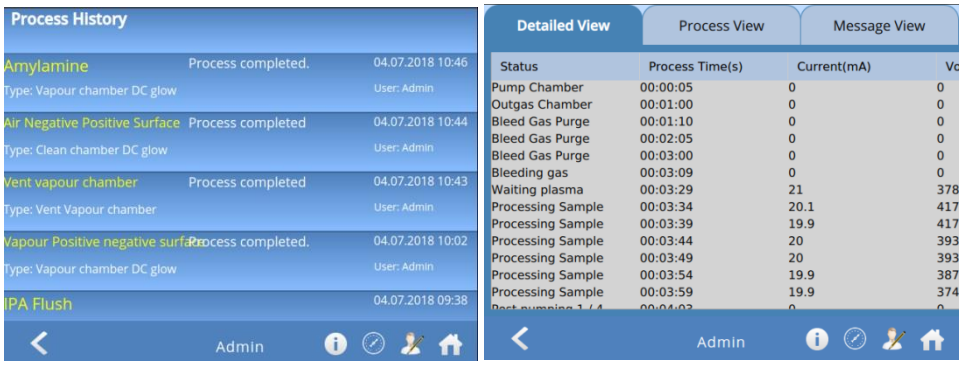


Figure 6-11. Process History screen (left) and Detailed View tab (right)

3. To view the details of a particular logged event tap on it. The *Detailed View* tab is displayed (see Figure 6-12). This shows the events that occurred during the process. The actual data displayed will depend on the process type.

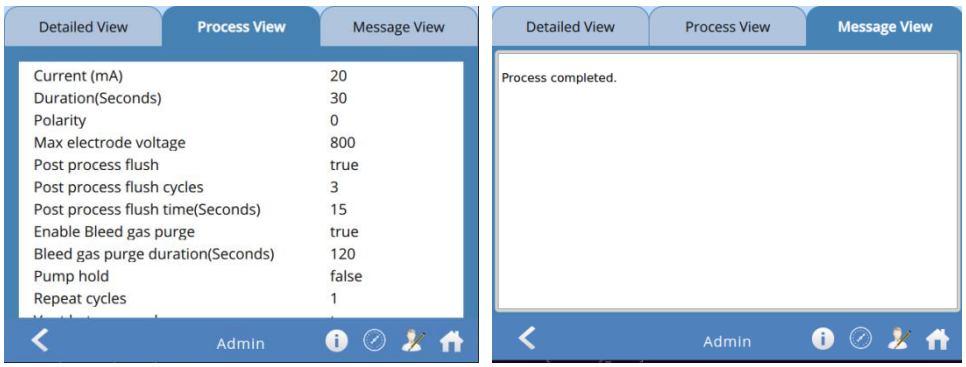


Figure 6-12. Process View (left) and Message View (right) tabs

4. Tap on the *Process View* tab to view the recipe parameters applied during the selected event.
5. Tap on the *Message View* tab for summary information including any error and warning messages if any problems were encountered during the process.
6. Tap on  to return to the *Process History* screen or on  to display the *Home* screen.

7 Maintenance

DANGER!

WARNING!

Wear gloves at all times. If using chemicals which may be harmful wear appropriate protective clothing and dissemble the GloQube Plus or components in a fume hood.

CAUTION!

Ensure mains electrical power is off during any maintenance and service activities.

7.1 Common Maintenance Tasks

Table 8 Maintenance Tasks

PROCEDURE	FREQUENCY
Change vial septum (see Figure 2-8)	After every use
Replace needle (see Section 7.2)	Regularly
Purge vapour delivery system with isopropanol (see Section 7.3)	After every use of amines and condensable material
Check and clean discharge sources and chambers (see Section 7.5).	Monthly
Inspect electrical power cords and plugs for general condition.	Regularly
Check vacuum pump oil level	Monthly
Change oil using 1 litre of supergrade 'A'.	6 Monthly
Check oil mist filter for saturation. This is a disposable plastic filter and cannot be reactivated.	6 Monthly or more regularly as required.

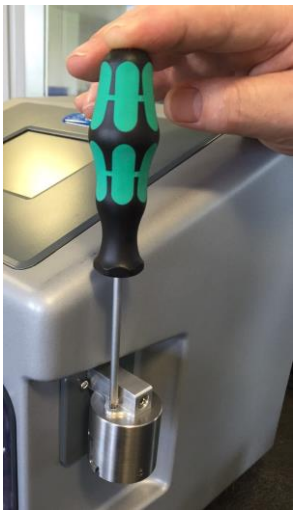
7.2 Replacing the Needle

WARNING!

When replacing the needle take great care as they are very sharp.

To replace the needle:

1. Remove the vial.
2. Remove the two screws retaining the vial mounting ring (see Figure 7-1).
3. Remove the locating ring.
4. Carefully remove the needle from the Luer adapter by turning the needle holder anti-clockwise.
5. Attach a new needle to the Luer adapter.
6. Replace the vial mounting ring and tighten the two screws. Check that the needle is tight in the fitting to ensure a good vacuum seal.



Remove the two screws (2)

Remove the vial mounting ring (3)

Remove the needle (4)

Figure 7-1. Replacing the needle

7.3 Removing the Vapour Valve

If the vapour valve does not open or the required vacuum is not achieved and the bleed valve remains open it may need cleaning or replacing.

1. Remove the hypodermic needle as described in the previous section.
2. Remove the solenoid valve cover by removing the M3x6 socket cap head screw.
3. Remove the manifold assembly by removing the two M3x20 socket cap head screws.
4. Unplug the valve power connector from the chamber socket.
5. Remove the valve from the manifold by removing the two M3x16 socket cap head screws.

(2) Cover retaining screw

(3) Manifold retaining screws

(4) Valve retaining screws and power connector

Figure 7-2. Removing the vapour valve

7.4 Cleaning the Vapour Valve

DANGER!

In some cases, the valve can be cleaned by soaking in isopropanol for a long period. Use a sonic bath if available, and clean until any residue is removed. It may be necessary to change the isopropanol a few times to remove all the residues. If residues still remain, replace the valve.

Figure 7-3. Cleaning a vapour valve in isopropanol

7.5 Cleaning the Chambers

7.5.1 Removing the Door

To remove the door:

1. Push the sliding locking bar to the left using the scalloped cut-out.
2. Pull the door outwards until the rails clear the body (see Figure 7-4).

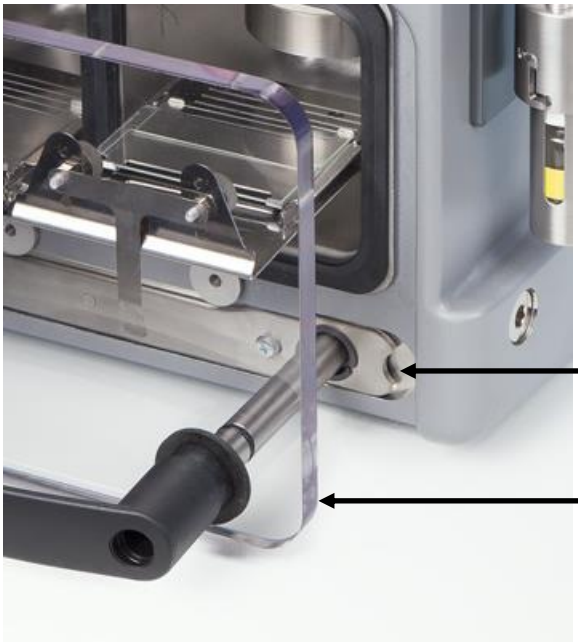


Figure 7-4. Door removal

7.5.2 Cleaning the Discharge Source

DANGER!

CAUTION!

The vapour chamber could have deposits from the hydrocarbons which have been used. Take suitable precautions and dispose of any cleaning cloths after use as required by your local safety policy.

The glow discharge source (and chamber walls) can be contaminated with deposited material. To clean the source:

1. Wearing suitable gloves, unscrew the glow discharge head by turning it anti-clockwise.
2. Clean the glow discharge head cover and central anode with suitable abrasive and isopropanol.
3. Clean the inside of the chambers with a lint-free cloth dampened with isopropanol.
4. After cleaning, reassemble and screw the discharge head back in to the top of the chamber by turning clockwise.

Figure 7-5. Glow discharge head: (left) in position and (right) removed

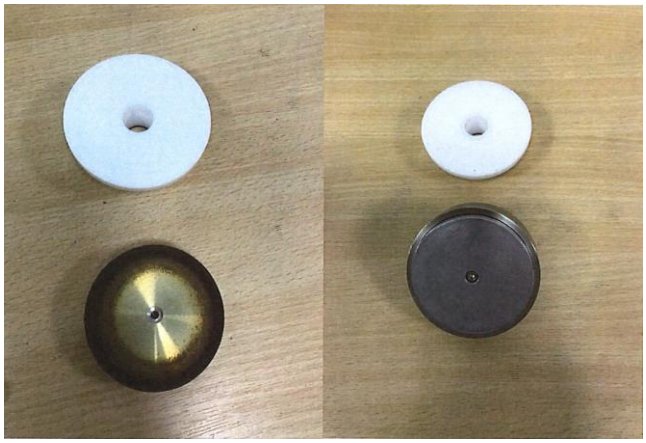


Figure 7-6. Glow discharge head: (left) before cleaning and (right) after cleaning

7.5.3 Replacing the Door

Align the two guide rods with the holes on the main body and push the door into place. The locking bar will latch automatically (See Figure 7-7).

Figure 7-7. Door replacement

7.6 Updating GloQube Plus Software

Periodically, Quorum will issue software updates for the instrument. These will be supplied on a USB flash drive. To update the software:

1. Mount the flash drive in the USB socket on the rear of the GloQube Plus (see Figure 2-1).
2. Log in using an Administrator account.
3. From the *Home* screen, tap on **System > File Manager > Update**.
4. The new update should be listed on the left side of the *Update* screen. Select it by tapping on its name.
5. Tap on the **Update** button.

When the update has finished, turn the GloQube Plus off and, after a few seconds, turn it back on.

When the system restarts, tap on **System > About** from the *Home* screen. The *About* screen shows the version number of the installed software (see Figure 6-4).

7.7 Spares and Consumables

Obtain consumable items from Quorum or an approved distributor only. Use only Quorum recommended items. For technical assistance and advice contact Quorum.

The following are available from Quorum, or your local distributor, and are featured in more detail on the Quorum website: www.quorumtech.com.

Table 9 Spare Parts for the GloQube Plus

SPARES	CATALOGUE NUMBER	QUANTITY
Hypodermic Needle Pack	26938	12
Lipped Door Seal	26864	1
Glass Vial Pack *(cap,septum,screw cap,seal and vial)*	26928	10
Metal Spacer *(Vial height extender)*	25264	1
Vapour Valve	25619	1
Septum and Vial Snap Cap	25265	1
Vial Lid	25267	1
Vial Sealing Washer	25560	1
Glass Vial	25266	1
Grid Holder	28273	1
Fuse, 5x 200mm 10A delay	LittelFuse 0215010.TXP	1

7.8 Service

It is recommended that the system is serviced annually by a Quorum engineer or approved distributor.

For technical and applications advice plus our on-line shop for spares and consumable parts visit www.quorumtech.com

7.9 Troubleshooting

Please note service and maintenance should be carried out annually by a Quorum engineer or approved distributor. In the event of non-operation, carry out the following checks:

CAUTION!

Disconnect the power cord BEFORE carrying out any servicing activities.

- Check power to Instrument.
- Check fuse.
- Check vacuum pump local switch should be in 'on' position.
- Check chamber door seal for vacuum leaks.
- Check operating conditions of Instrument controls.
- Check glow discharge heads and connections.
- Check all connections.

7.10 Error Messages

Table 10 Error Messages

Error messages	Description of fault
Vacuum interlock	Vacuum interlock signal was not detected
Pump down timeout	System failed to reach operational vacuum
Plasma error	System failed to generate plasma
Short on target	Short circuit detected on target
Plasma dropout	Plasma failed during process

8 Appendices

8.1 Recipe Parameters

Operation of the GloQube Plus is controlled by a process recipe. There are several types of recipe as listed in Table 11. Each recipe contains a number of adjustable parameters. The following tables list the parameters available in each type of recipe, showing their default values and allowed ranges.

Table 11 Clean Chamber DC Glow recipe parameters

Name	Default Value	Minimum Value	Maximum Value	Comment
Current (mA)	20	1	50	Discharge current
Polarity	Negative	Negative	Positive	Charge polarity of source
Duration* (s)	120	1	900	Plasma on time
Post process flush cycles*	1	1	5	No of cycles that chamber flushed post process
Bleed Vacuum* (mbar)	$1.5x10^{-1}$	$1.0x10^{-1}$	1	Pressure at which the process starts
Operational Vacuum* (mbar)	$1x10^{-1}$	$1.0x10^{-2}$	1	Target chamber pressure
Slow Vent	Yes	No	Yes	Enable/disable soft venting
Fast Vent Time (s)	15	1	30	Duration of fast vent
Slow Vent Time (s)	15	1	300	Duration of slow vent
Process logging interval* (s)	5	0.5	60	Time steps between log records

* Admin group level required to edit this property

Table 12 Vapour Chamber DC Glow recipe parameters

Name	Default Value	Minimum Value	Maximum Value	Comment
Current (mA)	20	1	50	Discharge current
Polarity	Negative	Negative	Positive	Charge polarity
Post process flush cycles	1	1	5	Number of cycles that chamber is flushed post process
Enable Bleed Gas Purge	No	No	Yes	Enable/disable flushing of vapour line
Duration (s)	120	1	600	Plasma on time
Post process flush*	Yes	No	Yes	Enable/disable post process flush
Post process flush time (s)	60	1	600	Duration of post process flush
Bleed gas purge duration* (s)	60	30	1800	Duration of bleed gas purge
Process Gas*	Vapour	Air	Vapour	Selection of gas delivery
Bleed vacuum* (mbar)	$1.5x10^{-1}$	$1.0x10^{-1}$	1	Pressure at which process starts
Operational Vacuum* (mbar)	$1x10^{-1}$	$1.0x10^{-2}$	1	Target chamber pressure
Slow Vent	Yes	No	Yes	Enable/disable soft venting
Fast Vent Time (s)	15	1	30	Duration of fast vent
Slow Vent Time (s)	15	1	300	Duration of slow vent
Process logging interval* (s)	5	0.5	60	Time steps between log records

* Admin group level required to edit this property

Table 13 Vent Clean/Vapour/Both Chamber recipe parameters

Name	Default Value	Minimum Value	Maximum Value	Comment
Fast Vent Time (s)	15	1	30	Duration of fast vent
Slow Vent	Yes	No	Yes	Enable/disable soft venting
Slow Vent Time (s)	15	1	300	Duration of slow vent

**Admin group level required to edit this property*

8.2 Overriding System Parameters in a Recipe

Some of the parameters in a selected recipe override system parameters (see page 24). In some cases, you need admin privileges.

Table 14 System override properties

Name	Normal system property	Description
Bleed Vacuum* (mbar)	1.5×10^{-1}	Pressure at which process is run
Operational Vacuum* (mbar)	1.0×10^{-1}	Pressure at which the process starts
Slow Vent	Yes	Enable/disable soft venting
Fast Vent Time (s)	15	Duration of fast vent
Slow Vent Time (s)	15	Duration of slow vent
Process logging interval* (s)	5	Time steps between log records

** Admin group level required to edit this property*

8.3 Technical Specification

Table 15 lists the technical specification of the GloQube Plus.

Table 15 Technical Specification

Power and processes	
Plasma current	1-40 mA
HV power supply	30 W
Maximum voltage	800 V
Electrode polarity Clean Chamber Vapour Chamber	 DC glow positive, DC glow negative DC glow positive, DC glow negative
Sample stage	125 x 100 mm (4.9” x 3.94”) with location for two 25 x 75 mm (1” x 3”) glass slides
Sample stage operational heights	Adjustable 12.5 mm (0.5”), 22.5 mm (0.9”) or 35 mm (1.38”)
Process time	1-900 seconds

Safety	
Chamber vent inlets	Filtered air inlets with slow vent to minimise sample disturbance
On-board reagent storage	Reagents (e.g. methanol or alkylamine) are contained in reusable sealed glass vials to minimise exposure to hazards.
High voltage safety interlocks	Hardware safety interlocked and software for process control

Vacuum	
Vacuum control	Integrated pirani gauge
Working vacuum range	0.1 to 1 mbar
Vacuum pump minimum requirements	5 m3/hr. Inlet flange: KF 16
Pumping time	Typical pump time to an operational vacuum of 1.0×10^{-1} mbar in 60 seconds
Vacuum isolation	Isolation valves to switch vacuum and prevent process chamber cross-contamination

User interface	
User interface	Full graphical interface with touch screen buttons and controls. In addition to displaying profiles, parameters, help screen and maintenance information are available
Profiles and profile logging	Capability to store 100 user profiles (name, date, time, vacuum, current and polarity)

Dimensions and communications	
Chamber size	100 mm W x 100 mm H x 127 mm D (3.94” x 3.94” x 5”)
Instrument size	366 mm W x 336 mm H x 364 mm D (14.4” x 13.2” x 14.3”)
Instrument weight	19.5 kg (42.9 lbs.) (GloQube Plus-D)
Pump (optional)	391 mm W x 127 mm D x 177 mm H (15.4” x 5” x 7”)
Pump weight	16 kg (35.3 lbs)
Footprint with optional pump	366 mm W x 600 mm D x 336 mm H (14.4” x 23.6” x 13.2“)
Power requirements	120 V 60 Hz, 15 A or 230 V 50 Hz, 10 A
Instrument power rating	100-240 V AC 60/50 Hz 700 VA including pump, IEC inlet
Optional pump power rating	115/230 V 60/50 Hz 450 W
Communication port	USB port for instrument software updates

Operating environment	
Temperature	15 - 25°C
Relative Humidity	<= 75%

8.4 Return of Goods

This section contains important safety information regarding the return of Preparation Equipment and Accessories.

8.4.1 General Introduction

The employer (user) is responsible for the health and safety of his employees. This also applies to all those persons who come into contact with the Preparation Equipment and Accessories either at the user's or manufacturer's premises during repair of service. The contamination of Preparation Equipment and Accessories has to be declared and the Health and Safety Declaration form completed. (Appendix - 8.4.5 for the form)

8.4.2 Health and Safety Declaration

Those persons carrying out repair or service have to be informed of the condition of the components. This is the purpose of the 'Declaration of Contamination of Preparation Equipment and Accessories'.

8.4.3 Despatch

When returning equipment the procedures set out in the Operating Instructions must be followed. For example:

- Drain the oil from the rotary pump.
- Remove filter elements.
- Seal all outlets.
- Pack glass components safely.
- Pack loose attachments securely, for example, stages.
- Seal in heavy duty polythene or a bag,
- Despatch in suitable transport container.

8.4.4 Return Address

F.A.O.: The Service Manager
Quorum Technologies,
Judges House
Lewes Road
Laughton
East Sussex
BN8 6BN

8.4.5 Declaration of Contamination Form

Table 16 Declaration of Contamination Form

Declaration of Contamination of Preparation Equipment and Accessories.

The repair and/or service of Preparation Equipment and Accessories can only be carried out if a correctly completed declaration has been submitted. Non-completion will result in delay. The manufacturer reserves the right to refuse acceptance of consignments submitted for repair or maintenance work where the declaration has been omitted.

This declaration may only be completed and signed by authorised and qualified staff.

1. Description of component

- **Equipment type/model:** _____
- **Code No:.** _____
- **Serial No.:** _____
- **Invoice No. (if known)** _____
- **Delivery Date.: (if known)**_____ _____

2. Reason for return:

_____
_____
_____
_____

3. Equipment condition

- **Has the equipment been used? Yes/No**
- **What type of operating medium was used?**

  _____
- **Is the equipment free from potentially harmful substances? Yes/No**

(If Yes go to Section 5)

(If No go to Section 4)

4. Process related contamination of Equipment/Accessories.

- **Toxic Yes/No**
- **Corrosive Yes/No**
- **Explosive* Yes/No**
- **Microbiological* Yes/No**
- **Radioactive* Yes/No**
- **Other harmful substances Yes/No**

*** We will not accept any Equipment/Accessories which have been radioactively, explosively, or microbiologically contaminated without written evidence that such Equipment/Accessories have been decontaminated in the prescribed manner.**

Please list all harmful substances, gases and dangerous by-products, which have come into contact with the Preparation Equipment and Accessories.

Trade name Product name Manufacturer	Chemical name and symbol	Danger class	Precautions associated with substance	First aid measures in the event of an accident
1.				
2.				
3.				
4.				
5.				

5. Legally Binding Declaration.

I hereby declare that the information supplied on this form is complete and accurate. The despatch will be in accordance with the appropriate regulations covering Packaging, Transportation and Labelling of Dangerous Substances.

Name of Organisation: _____

Address: _____

_____ **Post Code:** _____

Tel.: _____ **Fax.:** _____

Name: _____ **Job Title:** _____

Date: _____ **Company Stamp:** _____

9 Index

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