

# GloQube® PLUS

## Glow discharge for TEM grid preparation



### Features

Glow discharge treatment for electron microscopy sample preparation

- Automatic control of vapour and air introduction
- Flush and purge cycles of vapour chamber and gas line
- Two chambers for separate in-air and in-vapour processes without contamination\*
- Fully automatic
- Loaded with typical standard recipes
- Password protected user profiles and programmable user recipes
- Negative and positive discharge modes
- Single door for easy sample loading
- Adjustable three height sample stage
- Intuitive touch screen control
- Safe vapour delivery using septum-sealed vials
- Automatic valving between chambers to prevent cross-contamination
- Fast and/or soft venting options
- Extended warranty option

\* Only one chamber can be used at a time

### Benefits

The complete system for all your glow discharge needs

- Short in-air cycle time
- Second chamber for separating in-air and in-vapour processes
- No cross-contamination between chambers due to post-process flush cycle
- Automatic vapour delivery ensures reliable and reproducible results
- Purge cycles reduce water vapour and oxygen concentrations, ensuring
- excellent yield of specifically orientated macromolecules
- Adjustable slow vent time to minimise sample disturbance
- Optional fast vent for rapid process times
- Safe handling of reagent
- Three level adjustable height sample stage ensures repeatable results

# GloQube® PLUS

## Glow discharge for TEM grid preparation

The GloQube® Plus is a cost-effective, compact and easy to use glow discharge system, designed to fulfil the needs of laboratories with TEM.

The primary application of the GloQube® Plus is to modify the surface of TEM grids in a way that it meets requirements for successful imaging of a variety of macromolecules. Integrated into one system, the two chambers enable the user maximum flexibility to choose which sample preparation technique they want to use: glow discharge in-air or in-chemical vapour, without downtime for cleaning or the risk of contamination and loss of samples.

The in-chemical vapour glow discharge doesn't just help with retaining molecules on the TEM grids, but it also allows the user to control the orientation and conformation. With automatic vapour control, the system ensures accurate concentrations of chemical vapour in the plasma, producing reliable and reproducible results.

Two chambers designed into one easy to use package provides a smaller footprint for the work-flow space and no cross-contamination between the chambers.

### Recommended applications

- Hydrophilisation and cleaning of TEM grids carbon support films\* for better sample spreading
- Improved adhesion and orientation of proteins, nucleic acids and antibodies
- TEM grid preparation for nanoparticle studies

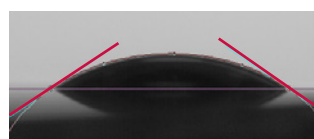
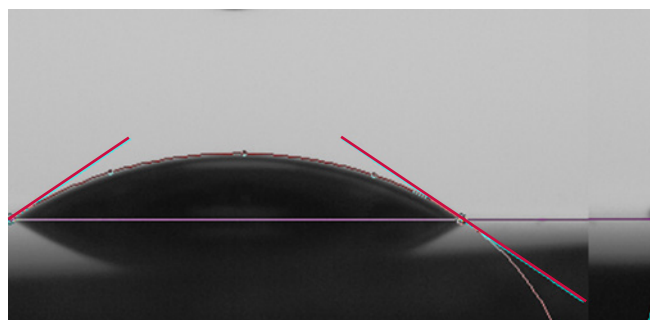
\*Typically: Formvar®, Lacey Carbon, Holey Carbon, Continuous Carbon, Quantifoil®

| Glow discharge processes |          |            |  |
|--------------------------|----------|------------|--|
| Surface state            | Charge   | Atmosphere | Typical applications   |
| Hydrophilic              | Negative | Air        | Hydrophilisation and cleaning of carbon coated TEM grids   |
| Hydrophilic              | Positive | Air*       | Nucleic acid adhesion to carbon films  |
| Hydrophobic**            | Positive | Alkylamine | Controlled orientation and improved adhesion of negatively charged proteins, antibodies and nucleic acids          |
| Hydrophobic**            | Negative | Methanol   | Controlled orientation and improved adhesion of positively charged protein molecules (e.g. ferritin, cytochrome c) |

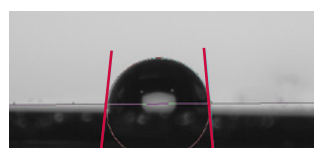
\* Air followed by post-treatment with magnesium acetate by the user.  
 \*\* Hydrophobic, as noted above, may represent a less hydrophilic sample of less than 90 degrees contact angle.

The GloQube® Plus is part of Quorum Technologies' internationally acclaimed EM Sample Preparation product range used by thousands of customers worldwide. Designed to provide high-quality solutions for SEM, TEM and thin-film applications. These products are for Research Use Only.

### Contact angles



Positive discharge using methanol shows carbon grid less hydrophobic



Negative discharge using amylamine shows carbon grid surface hydrophobic

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## Glow discharge for TEM grid preparation

### Twin chambers prevent cross-contamination

The GloQube® Plus uses a single door with two independent vacuum chambers and adjustable sample stages.

The in-air chamber is for simple glow discharge hydrophilic applications, while the in-vapour chamber is designed for hydrophobic (negative or positive) conversions, typically using reagents such as methanol and amylamine.

By utilising purge and flush cycles, we ensure contamination from the vapour chamber\* does not affect the in-air chamber.



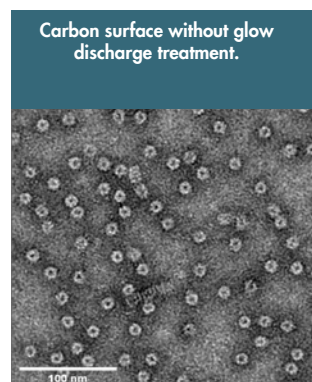
\* For health and safety reasons when using the in-vapour chamber with chemicals the pump exhaust must be vented to a suitable external extraction system.

### Automatic valve

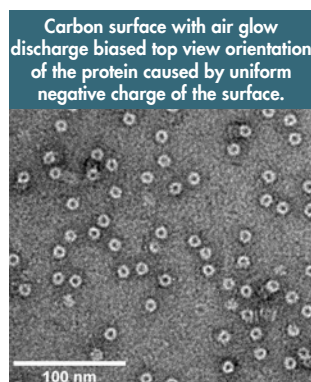
The automatic valve system allows greater control over the introduction of chemical vapour into the chamber. This results in reproducibility and repeatability of processing. The self-contained nature of the septum-sealed chemical vials and the delivery system ensures minimal user contact and a high level of operator safety.\*\*

\*\* Chemical preparation and disposal should be carried out in a suitable fume hood.

TEM images of the 20S human proteasome complexes, showing the effect of altering the surface charge of the carbon support film on the orientation of the protein. 2.5 nm of carbon film on Quantifoil 1.2/1.3 400 mesh was used as a support for the sample.



Visible some side-views of the protein due to uneven charge of the surface.



Biased top-views 20s proteasome complex adsorption on in-air glow discharge modified carbon support TEM grids.

| Ordering information            |  |
|---------------------------------|--|
| 025235                          | GloQube-D. Dual chamber glow discharge system, including:<br>Accessory kit, including: mains power lead, rotary pump power lead,<br>750 mm long flexible stainless steel vacuum tube with clamps,<br>fuses 10 x 025266 glass vials,<br>3 x vial caps and sealing washers,<br>1 x 025345 needle (spare)<br>Vacuum pump to be ordered separately |
| Vacuum pumping                  |  |
| 13034                           | 5 m <sup>3</sup> /hr Pfeiffer DUO 6 two-stage rotary vacuum pump with O7803 oil mist filter  |
| O7803                           | Oil mist filter (spare)  |
| Options, accessories and spares |  |
| 025195                          | Microscope slide tray  |
| 025266                          | Glass vial (packet of 10)  |
| 025267                          | Glass vial caps (packet of three)  |
| 025345                          | Needle   |
| 024755                          | Door seal  |



Biased side-view orientation of the protein caused by uniform positive charge on the surface.



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## Glow discharge for TEM grid preparation

### Easy sample loading

Each of the twin chambers can accommodate two 25 x 75 mm glass microscope slides or TEM grid holders. Loading could not be easier using a drawer-style chamber door and specimen stages. The stages are height adjustable and fitted with removable glass slide holders. The door and stages can be completely removed for convenience and to allow easy access for chamber cleaning.

### Process control

The GloQube® Plus is an automated system, which has a recipe driven process control user interface for ease of use. Filtered inlets ensure that delicate samples, such as carbon coated TEM grids, are not contaminated with particles or dust.

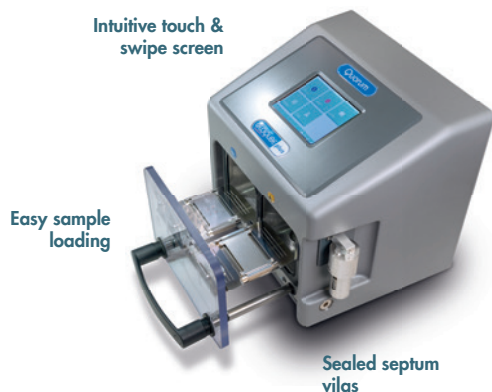
The GloQube® Plus requires a single vacuum pump working in the 0.1 to 1 mbar range and has a typical pump downtime to operational vacuum of 60 seconds and a total cycle time in-air of usually less than two minutes\*. A 750 mm flexible stainless vacuum hose is supplied with the GloQube® Plus.

\* Using a 30 second glow discharge process

### Touch screen control – rapid data input, simple operation

New user interface has been extensively updated:

- Capacitive touch screen has improved sensitivity for ease of use
- User interface software has been completely revised, using a modern smartphone-style interface
- Comprehensive context-sensitive help screen
- USB interface allows easy software updates and backing up/copying of recipe files to USB stick
- Process log files can be exported via USB port in .csv format for analysis in Excel or similar. Log files include date, time and process parameters.
- 16GB of flash memory can store more than 1000 recipes
- Dual-core ARM processor for a fast, responsive display



| Specifications                      |   |
|-------------------------------------|---|
| Glow discharge processes            |   |
| Plasma current                      | 1-50 mA   |
| HV power supply                     | 30 W  |
| Maximum voltage                     | 800 V   |
| Electrode polarity – clean chamber  | +/-   |
| Electrode polarity – vapour chamber | +/-   |
| Sample stage                        | 125 x 100 mm with location for two glass slides 25 mm x 75 mm and a 36 place grid holder              |
| Pump hold time                      | 0-72 hours  |
| Plasma process time                 | 1-900 seconds   |
| Safety                              |   |
| Chamber vent inlets                 | Filtered air inlets with slow vent to minimise sample disturbance                                     |
| On-board reagent storage            | Reagents are contained in 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 m <sup>3</sup> /hr, inlet flange: KF 16   |
| Pumping time                        | Typical pump down time to an operational vacuum of 0.1mbar in less than 60 seconds                    |
| Vacuum isolation                    | Isolation valves to switch vacuum and prevent process chamber cross-contamination                     |
| Dimensions and communications       |   |
| Chamber size                        | 100 mm W x 100 mm H x 127 mm  |
| Instrument size                     | 336 mm W x 364 mm D x 336 H   |
| Instrument weight                   | 19.4 kg (packed 24 kg)  |
| Pump (optional)                     | 391 mm W x 127 mm D x 177 mm H  |
| Pump weight                         | 16 kg   |
| 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  |
| Pump rating                         | 115/230 V 60/50 Hz 450 W  |
| Interface                           | USB   |
| Display                             |   |
| Dimension                           | 115.5 mm W x 86.4 mm H (active area), 640 RGB x 480 (display format), capacitive touch colour display |