Quorum Technologies

K100X Glow Discharge Instruction Manual

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

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Issue	Date	Details	Revised By
1	03/04/2000	Initial Issue for new instrument	DJR
2	10/09/2002	Page 1 Photo added	RIS
3	25/06/2007	Company name change, new document layout	JLS

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.

1 Contents

1.1 Section Contents

1.2 List of Figures

1.3 List of Tables

2 Health and Safety

Safety is very important when using any instrumentation.

Quorum Technologies Ltd is committed to providing a safe working environment for its employees and those that use it's equipment and conducts its business responsibly, and in a manner designed to protect the health and safety of its customers, employees and the public at large. It also seeks to minimise any adverse effects that its activities may have on the environment.

Quorum Technologies Ltd regularly reviews its operations to make environmental, health and safety improvements in line with UK and European Community legislation.

Quorum Technologies Ltd cannot be held responsible for any damage, injury or consequential loss arising from the use of its equipment for any other purposes, or any unauthorised modifications made to the equipment.

All service work carried out on the equipment should only be undertaken by suitably qualified personnel. Quorum Technologies Ltd is not liable for any damage, injury or consequential loss resulting from servicing by unqualified personnel. Quorum Technologies Ltd will also not be liable for damage, injury or consequential loss resulting from incorrect operation of the instrument or modification of the instrument.

2.1 Control of Substances Hazardous to Health (COSHH)

The E.C. legislation regarding the “Control of Substances Hazardous to Health” requires Quorum Technologies Ltd to monitor and assess every substance entering or leaving their premises. Consequently any returned goods of whatever nature must be accompanied by a declaration form Health and Safety Declaration form completed. (Appendix -7.3.5 for the form)

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

2.2 WEEE Compliance

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

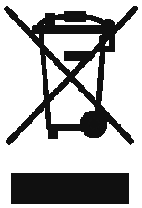


Figure 2-1: WEEE Directive Symbol

For full details of our environmental policies including WEEE please visit http://www.quorumtech.com/environmental_policy.htm

2.3 Conformity

This Equipment of this Design and manufacture and marked CE, conforms with the requirements of the European Directives EMC 89/336/EEC & LVD 73/23/EEC.

2.4 Hazard Signal Words

The standard three hazard signal words are defined as follows:

- **DANGER** - *imminently* hazardous situation or unsafe practice that, if not avoided, *will* result in death or severe injury.
- **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.

2.5 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

3 Description

3.1 K100X Glow Discharge

The K100X produces a plasma current of 0 - 50mA With Positive or Negative Polarity with 60mm dia. Aluminium electrode.

The rotary vacuum pump is controlled by the Instrument throughout the fully automatic coating cycle.

The Polarity of the Head can be selected from Positive to Negative with respect to Earth, for Carbon Film Surface Treatment or Surface Etching of Metallic Specimens.

Figure 3-1: K100X Glow Discharge

3.1.1 Hydrophilisation

Freshly made Carbon support films tend to have a hydrophobic surface which inhibits the spreading of suspensions of particles in Negative staining solutions. However, after Glow Discharge treatment with air, the Carbon Film is made Hydrophilic and Negatively charged, thus allowing easy spreading of aqueous suspensions. With subsequent Magnesium Acetate treatment the surface is made Hydrophilic and Positively charged.

In addition to Glow Discharge treatment using air, other process gases may be used to modify surface properties. For example, if Alkylamine is used as a process gas, the Carbon Film surface will become Hydrophobic and Positively charged. On the other hand, using Methanol as a process gas results in the surface becoming Hydrophobic and Negatively charged.

Such treatments can facilitate the optional absorption of selected biomolecules.

3.2 Summary

GLOW DISCHARGE		
Atmosphere	**Surface**	**Charge**
Air	Hydrophilic	Negative
Air	Hydrophilic	Positive (With subsequent Magnesium Acetate treatment)
Alkylamine	Hydrophobic	Positive
Methanol	Hydrophobic	Negative

Table 1: Glow Discharge

3.2.1 Surface Cleaning

In many instances, surfaces need to be completely cleared of contamination films or deposits. This applies particularly to EM components where such deposits impair the maintenance of a clean vacuum system. A Glow Discharge treatment can be used to clean such components of undesirable residues.

3.2.2 D.C. Glow Discharge

The default for Glow Discharge treatment is DC- mode.

In the DC+ Mode, the Glow Discharge system can draw up 1.0Kv. This allows high efficiency ion etching of the specimen surface to remove, for example, oxide or resist layers.

3.3 Specifications

Specifications of the K100X Glow Discharge Unit

Plasma Voltage	0-1000V Variable DC @ 100mA.
Electrode Polarity	+DC or –DC with Stainless Steel Electrode 60mm Dia
Chamber (Glass)	165mm Dia x 125mm High
Safety Shield	Polycarbonate
H.T. Vacuum Interlock	
Needle Valve Control	
Instrument Case	450mm Wide x 350mm Deep x 175mm High
Weight	18.0 Kg (unpacked)
Operating Vacuum	Up to 10^{-2} mbar

3.3.1 Services

Electrical Supply	230V 50 Hz 6 Amp max Supply 115V 60 Hz 12 Amp max Supply
Vacuum Pump	No 5 Pump or similar (approx 6m3/hour) pumping speed. Oil mist filter, Vacuum Hose, (included with instrument.) is needed (see Emitech EK3175)

4 Installation

WARNING – MAINS LEAD

This Equipment must be Earthed and fitted with the correct lead for the country of operation. This will normally be achieved from the correct mains supply socket.

It is important that this equipment is installed and operated by skilled personnel in accordance with these instructions. Failure to do so may result in damage, and impair protection provided. 'If in doubt - ask'.

A suitable location should be provided for the unit - either operated on a bench or the recommended trolley. The total weight of the system is 18 Kg. The system operating environment ambient temperature range is 15^{O}C to 25^{O}C in a non condensing relative humidity of not more than 75%. Sufficient ventilation is required, and positioning should be out of direct sunlight. The system is rated for continuous operation other than those supplies specified.

4.1 Preliminary Checks

Remove Instrument from packing and place on appropriate operational position. Carry out visual inspection for any signs of transit damage.

Remove Accessories Pack and check contents against K100X Accessories Pack Shipping List.

Ensure that all areas of the Instrument are free of loose packaging material. Check specifically the Instrument chamber, glass cylinder, and 'L' gaskets. (Do not use vacuum grease on gaskets.)

Where a vacuum pump has been supplied, carry out preliminary checks in accordance with manufacturers recommendations. (Refer to: Appendix 7.2)

NOTE: - If you are using existing or alternative vacuum pump, and have any difficulty with connections, please advise.

4.2 Connections

WARNING – EARTH CONNECTOR

This Equipment is normally supplied from 3 pin supply including Earth.
If only 2 pin supply is available a separate Earth must be fitted.
The supplementary Earth stud can be used to facilitate this requirement.

Connections should only be made in accordance with instructions. Refer To: Figure 4-1 and Table 2.

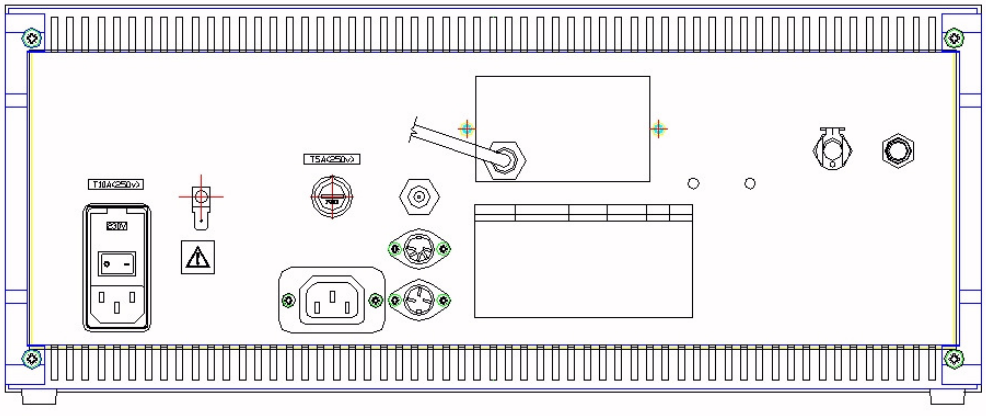


Figure 4-1: K100X Rear Panel

UNDER NO CIRCUMSTANCES SHOULD ANY OTHER CONNECTIONS OR OUTLETS/INLETS BE USED FOR ANY OTHER EQUIPMENT OR SERVICES.

WARNING - OUTPUT

This is for the pump supply only and is the mains voltage at a maximum of 8 Amps

TITLE	FUNCTION
Rocker Switch/ Power Inlet/ Fuseholder	Main power on to Instrument.
Pump Out	Power out to pump controlled by Instrument
Gas Inlet	Process gas inlet supply from low pressure regulator.
Coating Output	HT output to cathode (target).

Table 2: K100X Rear Panel Functions

NOTE: - Any other items on rear panel not listed are for common manufacturing and are not available for this Instrument.

Note: - A single phase AC supply with Earth is required - selected to the correct voltage for the country of operation. Either nominal 240V or nominal 120V. The voltage and frequency range is:

Nominal 240	Max. Current 10A	200 - 264V	47Hz To 63Hz
Nominal 120	Max. Current 20A	90V - 132V	47Hz To 63Hz

Table 3: K100X Power Requirements

For fuse ratings and voltages refer to: Table 10 and Table 11 Fuse Listings

If required, carry out process gas connections to rear panel (Refer To: Figure 4-1) with tubing and connectors provided. The connector is push-fit and will 'snap' into a locked position. It can be released by depressing the metal tongue. Any gas connected should be regulated at a nominal pressure of 4 p.s.i. (approx 0.3 bar)

NOTE: Glow discharge is normally in air, so a process gas is NOT required.

The electrical input to the Instrument is made with the power lead provided. The Instrument connection is standard and the lead is fitted with the appropriate plug for the country of operation.

Ensure the plugs are firmly located. Check the voltage is correct voltage for country of operation which should correspond to the voltage label on the Instrument. The appropriate electrical supplies for countries are given in Table 12.

The vacuum connection is made by 1 Metre length of vacuum hosing. This is a push-on fit to the Instrument. Ensure that this is firmly in place to the full length of the vacuum connector.

NOTE: - If you are using existing or alternative vacuum pump, and have any difficulty with connections, please advise.

An Oil Mist Filter with metal adapter should be fitted to outlet of vacuum pump (See Section Spares 6.2).

Check that the vacuum pump is filled with correct oil (See Section Spares 6.2 for suitable type). If the vacuum pump is fitted with an **ON**/**OFF** switch, ensure that it is left in the **'ON'** position as the Instrument will carry out required control.

Ensure that the HT connector to the lid is pushed firmly in place.

4.3 Initial Operating Checks

(These should be made having become familiar with the controls. Refer to Section 5 Operation)

ALL SUPPLIES ARE CONTINUOUSLY RATED WITH THE EXCEPTION OF THE H.T. SUPPLY WHICH IS RATED AT 50%.

Switch power on with rocker switch located on rear panel of Instrument. The L.E.D. in the **STOP** switch should illuminate showing power to the instrument, and the L.C.D. should show the following display:

```
Press ENTER to change parameters
Press START to run when ready

Settings: Neg., 25mA, 00:02:00  H:M:S
```

Check process gas by pressing the **STOP** button. The process gas cylinder output gauge will drop slightly. The K100X lid will lift 'slightly' when chamber fills with gas.

When the display has returned to the initial layout as above press the **START** key. The chamber vacuum reading should achieve 5 x 10^{-1}mbar within 1 minute, and 1 x 10^{-1} mbar (the bleed trip point) within 2 minutes.

```
Bleeding Gas into Chamber
Time Remaining  00:00:14  H:M:S

Vacuum :  2x10-1 mbar
```

Provided that Pump Hold is NOT enabled (see Section 5.5) the gas bleed portion of the cycle will commence. the screen display should look like that shown below. If necessary, adjust needle valve at rear of Instrument to achieve a stable vacuum of 1 x 10^{-1}mbar.

When the bleed time has expired the coating will commence. A Pink plasma (with air) with the required current level should be observed. The display should look like that below. Allow the coating to automatically time-out and vent the chamber to atmosphere. The instrument should complete the automatic cycle, coating at 25mA for 2 minutes (which are default settings) at a vacuum 1 x 10^{-1}mbar which may initially need to be adjusted.

```
Negative Discharge at 25 milliamps

Vacuum      Current   Time Remaining
1x10-1 mbar    25 mA   00:01:38 H:M:S
```

NOTE: The discharge cycle is rated for a Max. 50mA for 5 minutes, with a duty cycle of 50%. (Off time - 5 minutes.)

5 Operation

5.1 Display

The diagram below shows the layout of the instrument front panel showing the LCD and the data entry keys.

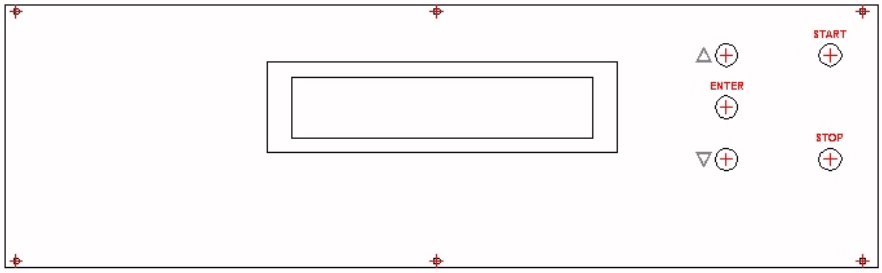


Figure 5-1: K100X Front Panel

MENU	OPERATION FUNCTIONS
UP KEY	Whilst a parameter is displayed increments its value by the increment amount.
DOWN KEY	Whilst the parameter is displayed decrements its value by the increment amount.
ENTER KEY	Pressing this key will accept the current value of the parameter and proceed to the next parameter or accept a set up
START KEY	Starts the process using the parameters accepted by the operator.
STOP KEY	Stops the process at any point during the cycle. (L.C.D. displays user aborted cycle.)

Table 4: K100X Front Panel Controls

5.2 Setting Operating Parameters

There are a number of user programmable options that can be altered by the front panel keys. These are :-

PARAMETER	ALLOWABLE VALUES	DESCRIPTION
Discharge Polarity	Negative (Default) Positive	
Discharge Current	0 - 50 mA in 5 mA Steps	Plasma Current, default value 25mA
Discharge Time	0 - 4 Minutes in one second steps	Time for the coating, default 2 Minutes
Pump Hold Enabled	Yes / No	Whether extra pumping is enabled or not. Default - No
Pump Hold Time	0 - 8 Hours in 5 Seconds Steps	How long extra pumping will last, default 10 Minutes

Table 5: Setting Operating Parameters

When options are modified, the software will by default save these so that they are in force the next time that the instrument is powered up

5.3 To Check or Modify Parameters

From the main menu press the **ENTER** to select the change parameters menu. The screen below should appear on the L.C.D.

```
UP or DOWN key to ALTER
ENTER to accept, STOP to return
Variable Name      Current Value
```

For most parameters the value is shown along with the variable name. Us the **UP** or **DOWN** arrow keys to amend the value as required. When the required value is shown press the **ENTER** key to accept. To exit from the parameter editing menu press the **STOP** key.

5.4 Cycle Sequence

Below is a sequence of events for a typical discharge cycle. Assuming the default values have not been altered and the instrument has been set up as instructions under Section 4.3

The suggested parameters which should be satisfactory for general applications are as listed.

1. Needle valve (bleed) adjustment set to give $1x10^{-1}$mbar with process gas (Air or a gas at a nominal 4 p.s.i.) (approx. 0.3 bar)
2. Discharge current at 25mA. (default)
3. Discharge time 2 minutes. (default)

After the pressing the **START** key the following will happen:

- The rotary pump will start and commence the pump down
- When the bleed trip point has been reached, if pump hold is not enabled (see below) the bleed valve will operate, and chamber vacuum will stabilise for 15 seconds at 1 x 10^{-1}mbar.(dependent upon needle valve setting)
- The Discharge will operate at deposition current of 25mA or whatever has been set.
- Coating will stop and the vent valve will open an the chamber will vent to atmosphere
- If further purging is required, the vent-stop can be operated by pressing the **STOP** button while the instrument is idle.

NOTE

The **STOP** button can be pressed at any time during a cycle to abort the process.

5.5 Pump Hold Feature

The Pump Hold feature is used for one of two conditions.

1. If it is required to outgas a specimen more than would be possible during the normal automatic cycle, then select Pump Hold as enabled in the parameter menu. This will inhibit the cycle from continuing until either, a key is pressed, or the stored Pump Hold time elapses, whereby the cycle will continue in the normal manner. The vacuum should eventually achieve better than 7 x 10^{-2} mbar.

2. If it is required to use a K250 for carbon 'flash' evaporation. If this is the case, then select Pump Hold and select a fairly long time, perhaps longer than 30 minutes. The K100X is now used as a vacuum chamber for carbon head. Using Carbon String or Cord, outgas vacuum of 1 x 10^{-1} mbar, and evaporation vacuum of 7 x 10^{-2} mbar or better. After completion of the carbon flash Stop on the K100X.

NOTE: For full details consult separate K250 Instruction Manual

When Pump Hold is enabled, the instrument will pump to the bleed trip point as normal, then the pump hold feature becomes active. The display should look like that below.

```
Pump Holding, Press a key to continue
Time Remaining:  00:04:36  H:M:S

Vacuum:  8x10-2 mbar
```

The pump hold time has a default value of 10 minutes but can be programmed for up to 8 hours. As stated above the instrument will continue pumping until either the time elapses or, a key is pressed. The cycle will then continue as normal

5.6 Glow Discharge

Both Glow Discharge Carbon Film Treatment, and Glow Discharge Etching can be obtained by experience with particular specimens.

For further details consult the following book

DUBOCHET, J. GROOM, M. and MUELER-NEUTEBOOM.

The Mounting of Macromolecules for Electron Microscopy with particular reference to surface phenomena and the treatment of support films by Glow Discharge.

Advances in Optical and Electron Microscopy,
Vol 8, pp107-135.
(Available on request)

6 Service and Maintenance

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

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

6.1 Maintenance

PROCEDURE	FREQUENCY
Clean the glass chamber and the 'L' gaskets as required using velin tissue and foam cleanser (C5427), or similar. **Do not use vacuum grease on 'L' gaskets.**	Monthly
Check vacuum pump oil level. Change oil every 6 months using 1 litre of Supergrade 'A'. (See Section 6.2).	Monthly
Check Oil Mist Filter for saturation. Change every 6 months, or more regularly as required. (See Section 6.2) for suitable part. (This is a disposable plastic filter and cannot be reactivated.)	Monthly
Regularly inspect electrical power cords and plugs for general condition	Regularly

Table 6:- Maintenance Tasks

6.2 Spares

The following are available from Quorum Technologies Ltd, or your local distributor, and are featured in more detail in the current Quorum Technologies Ltd Consumables Catalogue. Copies can be sent on request.

SPARES FOR K100X GLOW DISCHARGE UNIT	CATALOGUE NUMBER	QUANTITY
Glass Cylinder 6"	G6260	Each
'L' Gaskets to suit	G6261	Pair
Oil Mist Filter	O7803	Each
Supergrade 'A' Rotary Pump Oil	O7802	1 Litre

Table 7:- Spare Parts for the K100X

6.3 Accessories

The following are available from Quorum Technologies Ltd, or your local distributor, and are featured in more detail in the current Quorum Technologies Ltd Consumables Catalogue. Copies can be sent on request.

USEFUL ACCESSORIES FOR K100X	CATALOGUE NUMBER	QUANTITY
Amberclens Foam Cleanser	C5427	Each

Table 8:- Accessories for the K100X

6.4 SEM Specimen Stubs

A comprehensive supply of S.E.M. specimen stubs in machined Aluminium to suit most makes of S.E.M.

DESCRIPTION	CATALOGUE NUMBER	QUANTITY
Amray		
½" Dia Pin Stub	S8620	Pack 10
1" Dia Pin Stub		
Cambridge		
½" Dia Pin Stub	S8622	Pack 10
1" Dia Pin Stub	S8623	Pack 10
1¼ Re-entrant Base Stub	S8624	Pack 10
1¼ Dia x $^{3}/_{8}$" High Stub	S8625	Pack 10
Camscan		
½" Dia Pin Stub	S8622	Pack 10
1½" Dia Pin Stub		
Etec		
½" Dia pin stub		
Hitachi		
15mm Dia x 6mm Stub	S8627	Pack 10
25mm Dia x 6mm Stub	S8628	Pack 10
32mm Dia x 10mm Stub		
I.S.I.		
15mm Dia x 10mm Stub	S8631	Pack 10
15mm Dia x 15mm Stub		
Jeol		
10mm Dia x 5mm Stub	S8633	Pack 10
10mm Dia x 10mm Stub	S8634	Pack 10
15mm Dia x 10mm Stub	S8631	Pack 10
15mm Dia x 15mm Stub	S8632	Pack 10
12.5mm Dia x 10mm Stub	S8635	Pack 10
12.5mm Dia x 5mm Stub		
Philips		
½" Dia Pin Stub	S8622	Pack 10

Table 9:- SEM Specimen Stubs for the K100X

6.5 Fuse Listings

Fuse listing for 230 Volt K100X

TITLE	RATING	FUNCTION
Fuse 1 (1.25" X 0.25")	**T 10A Ceramic**	**Main Power, located in inlet unit.**
Fuse 2 (20 x 5 mm) (INTERNAL)	**T3.15 Ceramic**	**HT Power Supply Fuse. Located on HT Supply PCB labelled F1**
Fuse 3 (20 x 5 mm) (INTERNAL)	**T 8A Ceramic**	**Rotary Pump Fuse. Located on HT Supply PCB labelled F2**

Table 10:- Fuse Listing for the 230 Volt K100X

Fuse listing for 115 Volt K100X

TITLE	RATING	FUNCTION
Fuse 1 (1.25" X 0.25")	**T 15A Ceramic**	**Main Power, located in inlet unit.**
Fuse 2 (20 x 5 mm) (INTERNAL)	**T 5A Ceramic**	**HT Power Supply Fuse. Located on HT Supply PCB labelled F1**
Fuse 3 (20 x 5 mm) (INTERNAL)	**T 10A Ceramic**	**Rotary Pump Fuse. Located on HT Supply PCB labelled F2**

Table 11:- Fuse Listing for the 115 Volt K100X

T10A is preferred fuse.

May be substituted for 10A Slo-Blo Ceramic Fuse - Non preferred..

Fuse Standard IEC 127, CEE4.

Fuse Standard CSA C22.2/UL 198G *

Replacement fuses can be supplied by EMITECH, or the approved distributor.**

** If an approved distributor is not known - please contact Quorum Technologies Ltd direct for details.

7 Appendices

7.1 World Wide Electrical Supplies

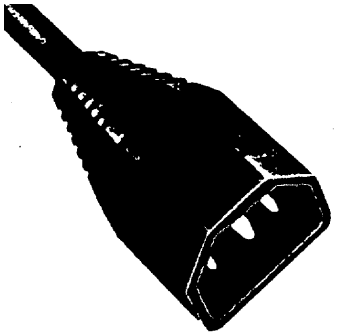
COUNTRY	VOLTAGE	FREQUENCY
Australia	240V	50Hz
Brazil	115V/230V	60Hz
Canada	115V	60Hz
Finland	230V	50Hz
France	230V	50Hz
Germany	230V	50Hz
India	230V	50Hz
Ireland	230V	50Hz
Israel	230V	50Hz
Italy	230V	50Hz
Korea (South)	230V	60Hz
Japan	115V	50 / 60Hz
Netherlands	230V	50Hz
Norway	230V	50Hz
Pakistan	230V	50Hz
Portugal	230V	50Hz
Scandinavia	230V	50Hz
Singapore	230V	50Hz
Spain	230V	50Hz
Taiwan	115V	60Hz
Turkey	230V	50Hz
United Kingdom	230V	50Hz
United States of America	115V	60Hz

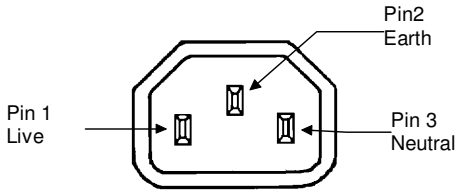
Table 12:- Electrical supplies World Wide

7.2 Pump Plug Wiring

WARNING – EARTH CONNECTOR

This Equipment is normally supplied from 3 pin supply including Earth.
If only 2 pin supply is available a separate Earth must be fitted.
The supplementary Earth stud can be used to facilitate this requirement.





PIN	UK AND EUROPE	U.S.A. AND CANADA
Pin 1 (Live or Hot)	Brown	Black
Pin 2 (Earth)	Green / Yellow	Green
Pin 3 (Neutral)	Blue	White

Table 13: Pump Plug Wiring

7.3 Return of Goods

Safety information for the return of Preparation Equipment and Accessories.

7.3.1 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 -7.3.5 for the form)

7.3.2 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.'.

7.3.3 Despatch

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

- Drain the vacuum pumps.
- Neutralise the flushing with gas.
- 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.

7.3.4 Return Address:

F.A.O.: The Service Manager,
Quorum Technologies Ltd,
Units 1 & 3 Eden Business Centre
South Stour Avenue,
ASHFORD,
Kent. TN23 7RS

7.3.5 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: _____

Table 14: Declaration of Contamination Form

8 Index

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