



Quorum Technologies

K550X Sputter Coater Instruction Manual



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Issue	Date	Details	Revised By
1	07/02/2000	Initial Issue for new instrument	DJR
2	10/09/2002	Page 1 Photo added	RIS
3	31/12/2003	Revision	JB
4	12/01/2007	Paragraph removed re: gas inlets	HR
5	01/08/2007	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.

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1 Contents

1.1 Section Contents

1	Contents	3
1.1	Section Contents	3
1.2	List of Figures	4
1.3	List of Tables	4
2	Health and Safety	5
2.1	Control of Substances Hazardous to Health (COSHH)	5
2.2	WEEE Compliance	5
2.3	Conformity	6
2.4	Hazard Signal Words	6
2.5	Fail Safe	6
3	Description	7
3.1	K550X Sputter Coater	7
3.1.1	Features	7
3.1.2	Benefits	8
3.2	Specifications	8
3.2.1	Services	8
3.3	K150X FTM Option	9
4	Installation	10
4.1	Preliminary Checks	10
4.2	Connections	11
4.3	Initial Operating Checks	13
5	Operation	14
5.1	Display	14
5.2	Setting Operating Parameters	15
5.3	To Check or Modify Parameters	15
5.4	Cycle Sequence	16
5.5	Pump Hold Feature	17
5.6	Sputtering Protocols	18
6	Service and Maintenance	19
6.1	Maintenance	19
6.2	Changing the Target	19
6.3	Troubleshooting the K550X	20
6.4	Spares	21
6.5	Accessories	22
6.6	SEM Specimen Stubs	23
6.7	Fuse Listings	24
7	Appendices	25
7.1	World Wide Electrical Supplies	25
7.2	Pump Plug Wiring	26
7.3	Return of Goods	27
7.3.1	General Introduction	27
7.3.2	Health and Safety Declaration	27
7.3.3	Despatch	27
7.3.4	Return Address:	27
7.3.5	Declaration of Contamination Form	28
8	Index	29

1.2 List of Figures

Figure 2-1: WEEE Directive Symbol	5
Figure 3-1: K550X Sputter Coater	7
Figure 3-2: K150X Film Thickness Monitor Option	9
Figure 4-1: K550X Rear Panel	11
Figure 5-1: K550X Front Panel.....	14
Figure 5-2: Sputtering Deposition Rate using Gold	16

1.3 List of Tables

Table 1: Specifications of the K550X Sputter Coater.....	8
Table 2: K550X Rear Panel Functions	11
Table 3: K550X Power Requirements	12
Table 4: K550X Front Panel Controls.....	14
Table 5: Setting Operating Parameters.....	15
Table 6:- Maintenance Tasks	19
Table 7:- Spare Parts for the K550X	21
Table 8:- Accessories for the K550X.....	22
Table 9:- SEM Specimen Stubs for the K550X.....	23
Table 10:- Fuse Listing for the 230 Volt K550X	24
Table 11:- Fuse Listing for the 115 Volt K550X	24
Table 12:- Electrical supplies World Wide.....	25
Table 13: Pump Plug Wiring	26
Table 14: Declaration of Contamination Form	28

2 Health and Safety

Safety is very important when using any instrumentation.

Quorum Technologies is committed to providing a safe working environment for its employees and those that use its 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 regularly reviews its operations to make environmental, health and safety improvements in line with UK and European Community legislation.

Quorum Technologies 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 is not liable for any damage, injury or consequential loss resulting from servicing by unqualified personnel. Quorum Technologies 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 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 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 K550X Sputter Coater

The K550X system employs a Magnetron Target Assembly, which enhances the efficiency of the process using low voltages, and giving a fine grain; cool sputtering, without the need to cool the target or the specimen stage.

The specimen stage accommodates a range of specimen types and stubs, which together with pre-selectable parameters and automatic control, gives defined and repeatable film thickness depositions.

The Instrument is fitted with 60mm diameter x 0.1mm thick, Gold, quick-change target giving optimum consumable cost performance.

The integrated instrument panel and plug-in electronics maximise 'up-time' and, with user-friendly designs, ensures satisfactory multi-user discipline.

The sputtering parameters can be pre-set, including the gas bleed needle valve, which has electromagnetic valve back-up.

The sputtering head is interlocked, and the system can easily accommodate a K250 Carbon Coating Attachment.

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



Figure 3-1: K550X Sputter Coater

3.1.1 Features

- Fully Automatic Control
- Low Voltage Sputtering
- High Resolution Fine Coating (Order of 2nm Gold Grain)
- Special Rotating Stage with full Tilt Facility fitted as standard
- Even Thickness Deposition (Typically 20nm or 200 Angstroms for SEM work)
- 165mm Diameter (6 inches) Chamber
- Can be integrated with Film Thickness Monitor

3.1.2 Benefits

- Easy to operate
- No cooling required
- Precise reproducible coatings
- Fully adaptable to a wide range of specimens
- Repeatable film thickness depositions
- Easy loading and unloading of specimens
- Can pre-set deposition thickness

3.2 Specifications

Specifications of the K550X Sputter Coater Unit

Instrument Case	450mm Wide x 350mm Deep x 175mm High
Work Chamber	Borosilicate Glass 165mm Dia x 125mm High
Safety Shield	Polycarbonate
Weight	18 Kg
Target	60mm Dia x 0.1mm Thick (Gold fitted as Standard)
Specimen Stage	60mm Dia. Rotating Stage with Tilt facility. (Spacing to Target 40mm)
Vacuum Gauge Range	ATM - 1×10^{-4} mbar
Deposition Range	0-50mA
Deposition Rate	0-25nm/Minute
Sputter Timer	0-4 minutes
Pre-set Needle Valve	Control of Argon Supply

Table 1: Specifications of the K550X Sputter Coater

3.2.1 Services

Services	Argon - Nominal 5 psi
Electrical Supply	230V 50 Hz 10 Amp max Supply 115V 60 Hz 16 Amp max Supply
Vacuum Pump	No 5 Pump or similar (approx 6m ³ /hour) pumping speed. Oil mist filter, Vacuum Hose, (included with instrument.) is needed (see Technologies EK3175)

3.3 K150X FTM Option

The **K550X** can be used with a film thickness monitor, which measures the thickness of coating deposited on a crystal in the chamber, and hence calculates the thickness deposited on the sample to give qualitative repeatable coatings.

The FTM can be used in two modes, AUTO or MANUAL. In manual mode the coating runs for the pre-selected time and the FTM is enabled so that it can count the deposition and disabled at the end of the coating process.

In Auto mode the required deposition is selected on the FTM and a control signal is asserted to inform the **K550X** that AUTO mode has been selected. When the required amount has been deposited, a control line from the K150X to the **K550X** will be asserted which tells the coater to stop. The coating time is loaded with a value, which acts as a time-out in the event of a fault with the FTM and no coating taking place.

By default the "FTM enabled" option is set to NO in the menu. If using an FTM set this option to YES. Connect the control lead to the 5-pin DIN socket at the rear of the **K550X** and the BNC lead to the BNC socket at the rear of the **K550X**.

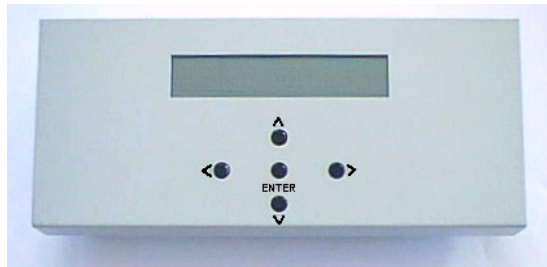


Figure 3-2: K150X Film Thickness Monitor Option

For further information see the K150X manual.

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°C to 25°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.

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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 K550X 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.

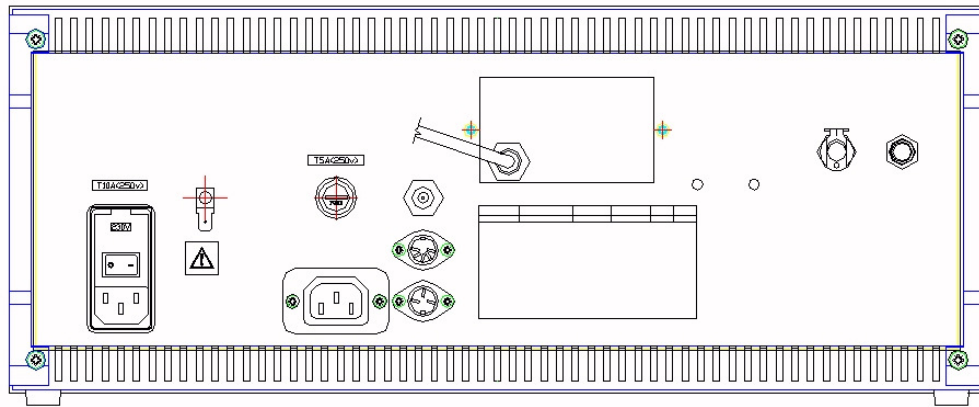



Figure 4-1: K550X Rear Panel

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).
Fuse 2	HT Power Supply Fuse

Table 2: K550X 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: K550X 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)

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 Appendix 7.5.

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 Spare 6.4).

Check that the vacuum pump is filled with correct oil (See Section Spares 6.4 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: 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 K550X 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 5×10^{-1} mbar within 1 minute, and 1×10^{-1} mbar (the bleed trip point) within 2 minutes.

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

Vacuum : 2×10^{-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 1×10^{-1} mbar.

When the bleed time has expired the coating will commence. A blue plasma 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 1×10^{-1} mbar, which may initially need to be adjusted.

Coating Sample at 25 milliamps

Vacuum Current Time Remaining
 1×10^{-1} mbar 25 mA 00:01:38 H:M:S

NOTE: The sputter cycle is rated for a maximum 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.

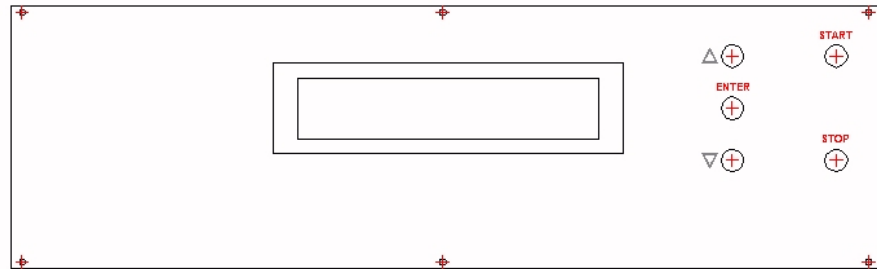


Figure 5-1: K550X Front Panel

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: K550X 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
Coating Current	0-50mA in 5mA Steps	Plasma Current. (Default value 25mA)
Coating Time	0-4 Minutes in one second steps	Time for the coating. (Default 2 Minutes)
FTM enabled	Yes/No	This value determines whether the software monitors the STOP signal from the FTM. If it is enabled and there is no FTM connected the coating will stop immediately.
Pump Hold Enabled	Yes/No	Whether extra pumping is enabled or not. (Default - No)
Pump Hold Time	0-8 Hours in 5 Second Steps	How long extra pumping will last. (Default 10 Minutes)
Stage Rotate Enabled	Yes/No	Rotate the specimen stage during the coating. (Default - No)

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	
<i>Variable Name</i>	<i>Current Value</i>

For most parameters the value is shown along with the variable name. Use 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 coating 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 1×10^{-1} mbar with process gas (Argon) at a nominal 4 p.s.i.) (approx. 0.3 bar)
2. Discharge current at 25mA. (default)
3. Discharge time 2 minutes. (default)

A typical coating achieved using these settings should be approximately 15nm (150 Angstroms).

NOTE: These conditions for coating thickness can be more readily determined by referring to the **K550X** Deposition Chart, (Appendix **Error! Reference source not found.**) allowing for any differences in the spacing of any stub and specimen height when reading final settings.

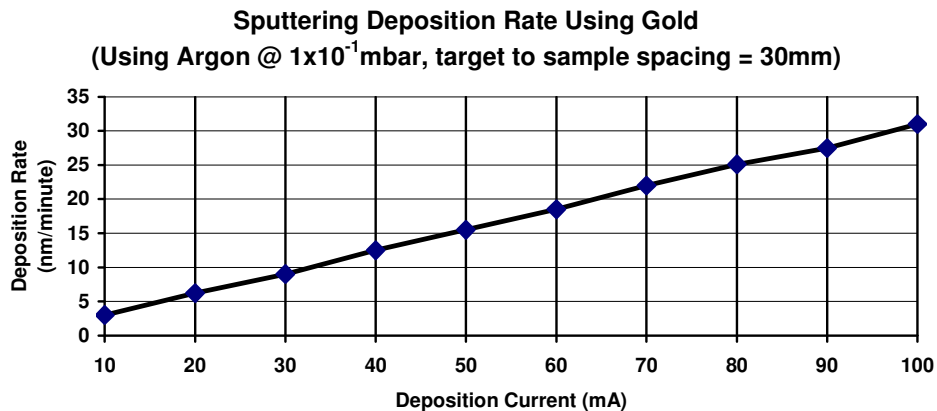


Figure 5-2: Sputtering Deposition Rate using Gold

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 1×10^{-1} mbar (dependent upon needle valve setting)
- Coat will operate at deposition current of 25mA.
- Coating will stop and the vent valve will open and 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 7×10^{-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 **K550X** is now used as a vacuum chamber for carbon head. Using Carbon String or Cord, outgas vacuum of 1×10^{-1} mbar, and evaporation vacuum of 7×10^{-2} mbar or better. After completion of the carbon flash Stop on the **K550X**.

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: 8×10^{-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 Sputtering Protocols

The following is only a brief outline and guide. For further details consult:-

1. **NOCKOLDS, C. E. MORAN, K. DOBSON, E. and PHILLIPS A.**
Design and operation of a high efficiency magnetron Sputter Coater.
Scanning Electron Microscopy (1982) Issue 3, pp. 907-915
(Available on Request)

The **K550X** is primarily to provide conductive metal coatings for SEM microscopy. In such applications it would be common to use Aluminium Specimen Stubs. The main classification of specimen types is between 'bulk' and 'particulate'.

In the case of 'bulk' specimens, a good bonding to the stub is required. In addition, although an omni-directional coating is achieved, it may be advantageous to use adhesives, which are electrically conductive. Silver Dag, a Silver Loaded Conductive Paint is commonly used, but to achieve a somewhat more substantial bonding, Silver Loaded Epoxy which has good strength and electrical conductivity is advantageous.

In the case of 'particulate' specimens, depending on the nature, again a thin layer of Silver Dag is suitable, with the specimens 'sprinkled' on it. Alternatively, a Cyanoacrylate or double-sided tape can be used. In both cases the mounting medium is of low profile. The coating should be sufficient to make electrical contact with the specimen and stub. If this is not the case, it may be necessary to bond using one of the previously mentioned conducting adhesives.

While the standard settings for Sputter Coating, mentioned in Section 5, Operation, may be satisfactory for most SEM applications (giving typically 15nm (150 Angstroms) settings: 25mA. 45mm. 2mins), these can be optimised depending on the specimen. The objective being to obtain as thin and continuous conductive coating as possible to avoid obstructing detail, while giving specimen stability and avoiding charging.

For very irregular specimens a slightly thicker coating may be required if charging is observed. While various settings such as time and spacing can be altered, we would recommend increasing the coating time, while maintaining the sputtering current and distances. (Giving typically 21nm (210 Angstroms) settings: 20mA. 45mm. 3mins.)

For less irregular specimens and thinner coatings for fine detail, where charging does not appear as significant, then reducing the sputtering current would be the preferred method. (Giving typically 10nm (100 Angstroms) settings: 15mA. 45mm. 2 minutes.)

The heat input from sputtering with the K550X is very small. If it is considered the specimen is heat sensitive, then a low sputtering current, with longer time to achieve the necessary coating thickness is recommended, while maintaining maximum specimen spacing. It is not considered necessary, with the low thermal input and low sputtering voltage, to pre-cool the specimen stage. Assuming the specimen is stable at room temperature.

The low sputtering voltage is to achieve low thermal input, and high resolution, small grain size coatings. Typically the grain size of Gold is of the order of 2nm (20 Angstroms). However, as we normally require somewhat thicker coatings to achieve electrical conductivity the final resolution will be somewhat less.

Alternative target materials may suggest smaller grain size, Gold/Palladium is the order of 1.7nm (17 Angstroms), there may not necessarily be a recognisable gain in high resolution, and such coatings may be susceptible to cracking. Careful consideration should be given when using alternative material, Gold having proved particularly successful for the majority of SEM work when utilised in Instruments such as the K550X

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 (See Section 6.4), 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 6.4).	Monthly
Check Oil Mist Filter for saturation. Change every 6 months, or more regularly as required. (See Section 6.4 for suitable part) (This is a disposable plastic filter and cannot be reactivated.)	Monthly
Check the condition of the target material. The wear will depend on use. This is mainly over an outer annulus, accounting for some 70% of the surface area. When the backing plate shows at the edges, it may still be used. When this becomes excessive and sputtering is affected, the target should be replaced	Monthly
Regularly inspect electrical power cords and plugs for general condition	Regularly

Table 6:- Maintenance Tasks

NOTE: A replacement target exchange service is offered for precious metal recovery. On return of your original target backing plate, a discount made against your new purchase.

6.2 Changing the Target

Firstly disconnect the instrument from the mains and remove the power cord. Now loosen the two small Allen screws around the circumference of the target holder using the Allen key provided with your spares kit. These locate into a 'V' groove in the target circumference; the target can then be removed. Replace with the new target, ensuring that the screws are tightened equally and firmly into the 'V' groove to ensure good electrical and mechanical connection.

NOTE: Consumable items can be obtained from Quorum Technologies or approved Distributor. Only Quorum Technologies recommended items should be used. For technical assistance and advice - contact Quorum Technologies.

6.3 Troubleshooting the K550X

Routine service should not be necessary. In the event of non-operation, carry out the following checks.

**CAUTION**

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

- Check electronic supplies: The LED in the STOP switch should be on at power up.
- Check fuses: Refer to Section 6.7.
- Check vacuum pump: Local switch should be in 'On' position.
- Check chamber seating for vacuum leaks.
- Check operating conditions of Instrument controls.
- Check Allen screws to target and connections.
- Check correct conditions for sputtering have been set (i.e. vacuum and gas pressure).
- Check all connections.
- Check that the LCD is showing the correct display.
- Check Pump Hold Enabled is set to NO.

In the event of all checks proving negative, please contact Quorum Technologies, or your local Distributor.

An Advance Delivery Modular Exchange Service Scheme is operated for the complete single module control electronics.

This can normally be customer installed in accordance with instructions provided.

NOTE: Spare items can be obtained from Quorum Technologies or approved Distributor. Only Quorum Technologies recommended items should be used. For technical assistance and advice - contact Quorum Technologies.

6.4 Spares

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

SPARES FOR K550X SPUTTER COATER 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
230v Fuse Pack	AL107037-1	Pack
215v Fuse Pack	AL107038-1	Pack
TARGETS - 60MM DIAMETER X 0.1MM THICK, BONDED TO TARGET HOLDER. EX-STOCK DELIVERY**		
Gold Target	EK8842	Each
Gold/Palladium (80/20%) Target	EK8843	Each
Platinum Target	EK8844	Each

Table 7:- Spare Parts for the K550X

** for special Targets please enquire

6.5 Accessories

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

USEFUL ACCESSORIES FOR K550X	CATALOGUE NUMBER	QUANTITY
Amberclens Foam Cleanser	C5427	Each
Conductive Paint	A5001	3g. Bottle
Silver Loaded Epoxy	A5002	2x15g.
Cyanoacrylate Adhesive Grade C2	A5003	5x5g.
Cyanoacrylate Adhesive Grade C4	A5004	5x5g.
Cyanoacrylate 'Superglue'	A5005	3g. Tube

Table 8:- Accessories for the K550X

6.6 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	S8621	Pack 10
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 ¾" High Stub	S8625	Pack 10
Camscan		
½" Dia Pin Stub	S8622	Pack 10
1½" Dia Pin Stub	S8626	Pack 10
Etec		
½" Dia pin stub	S8622	Pack 10
Hitachi		
15mm Dia x 6mm Stub	S8627	Pack 10
25mm Dia x 6mm Stub	S8628	Pack 10
32mm Dia x 10mm Stub	S8629	Pack 10
I.S.I.		
15mm Dia x 10mm Stub	S8631	Pack 10
15mm Dia x 15mm Stub	S8632	Pack 10
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	S8636	Pack 10
Philips		
½" Dia Pin Stub	S8622	Pack 10
1" Dia Pin Stub	S8623	Pack 10

Table 9:- SEM Specimen Stubs for the K550X

6.7 Fuse Listings

Fuse listing for 230 Volt K550X

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	Internal Fuse Holder mounted on HT PCB

Table 10:- Fuse Listing for the 230 Volt K550X

Fuse listing for 115 Volt K550X

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	Internal Fuse Holder mounted on HT PCB

Table 11:- Fuse Listing for the 115 Volt K550X

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 QUORUM TECHNOLOGIES, or the approved distributor.**

** If an approved distributor is not known - please contact Quorum Technologies 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

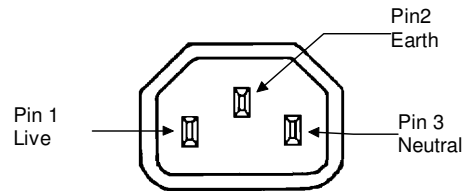
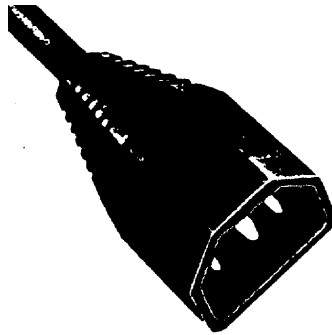


WARNING – EARTH CONNECTOR

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,
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. <table style="width: 100%; border: none;"> <tr> <td style="width: 80%;">- Toxic</td> <td style="width: 20%;">Yes/No</td> </tr> <tr> <td>- Corrosive</td> <td>Yes/No</td> </tr> <tr> <td>- Explosive*</td> <td>Yes/No</td> </tr> <tr> <td>- Microbiological*</td> <td>Yes/No</td> </tr> <tr> <td>- Radioactive*</td> <td>Yes/No</td> </tr> <tr> <td>- Other harmful substances</td> <td>Yes/No</td> </tr> </table>			- Toxic	Yes/No	- Corrosive	Yes/No	- Explosive*	Yes/No	- Microbiological*	Yes/No	- Radioactive*	Yes/No	- Other harmful substances	Yes/No
- 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: _____ <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> Tel.: _____ Name: _____ Date: _____ </div> <div> Post Code: _____ Fax.: _____ Job Title: _____ Company Stamp: _____ </div> </div>																

Table 14: Declaration of Contamination Form

8 Index

A		L	
Accessories	22	List of Figures	4
adhesives	18	List of Tables.....	4
Aluminium Specimen Stubs	18	M	
Appendices.....	25	Maintenance.....	19
B		O	
Benefits	8	Oil Mist Filter	12
C		Operation	14
C.O.S.H.H.	5	Operation Functions.....	14
Changing the Target.....	19	P	
Check or Modify Parameters.....	15	Preliminary Checks	10
Coating Current	15	Pump Hold Feature.....	17
Coating Time	15	Pump Plug Wiring	26
Conformity	6	R	
Connections	11	Return of Goods.....	27
Contents	3	Despatch	27
Cycle Sequence	16	General Introduction.....	27
D		Health and Safety Declaration.....	27
Declaration of Contamination Form	28	Return Address	27
Description	7	S	
Display.....	14	Section Contents.....	3
F		SEM Specimen Stubs	23
Fail Safe	6	Service and Maintenance.....	19
Features	7	Services	8
Fuse Listings	24	Setting Operating Parameters	15
H		Spares.....	21
Hazard Signal Words	6	Specifications.....	8
Health and Safety	5	Sputtering Protocols.....	18
I		Sputtering Rate	27
Index.....	29	T	
Initial Operating Checks	13	Targets	21
Installation	10	Troubleshooting the K550X	20
K		W	
K150X FTM Option.....	9	WEEE Compliance	5
K550X Sputter Coater	7	World Wide Electrical Supplies.....	25



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