



Quorum Technologies

## K575X Sputter Coater Instruction Manual



For technical and applications advice plus our on-line shop for spares and consumable parts visit [www.quorumtech.com](http://www.quorumtech.com)

Quorum Technologies Ltd

South Stour Avenue

Ashford

Kent

TN23 7RS

UK

Email:

Website:

Tel: +44 (0) 1233 646332

Fax: +44 (0) 1233 640744

sales@quorumtech.com

<http://www.quorumtech.com>

For further information regarding any of the other products designed and manufactured by Quorum Technologies, contact your local representative or directly to Quorum Technologies at the address above.

Issue	Date	Details	Revised By
1	09/08/1999	Initial Issue	DJR
2	22/09/1999	Amended list of default values	DJR
3	19/0620/00	Corrected vacuum pump down information	DJR
4	23/04/2003	Amended Picture and some text.	RIS
5	19/12/2003	Amended FTM section	JB
6	17/05/2005	Added Target Information	HJR
7	21/03/2007	Amended target information	HJR
8	03/04/2007	No Cycles and clean current and parameters & FTM user defined tooling factor adjustments added.	PRM
9	21/05/2007	Amended target information. Amended company name and email address	KJW
10	01/08/2007	Company name change, new document layout	JLS
11	20/02/2008	Modifications to maintenance procedure NCR124	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.

Quorum Emitech is a wholly owned business of Quorum Technologies Limited. Registered offices Unit 19 Charlwoods Road, East Grinstead, West Sussex. RH19 2HL. Registered in England and Wales, company No. 4273003.

# 1 Contents

## 1.1 Section Contents

<b>1</b>	<b>Contents .....</b>	<b>3</b>
	1.1 Section Contents .....	3
	1.2 List of Figures .....	4
	1.3 List of Tables .....	4
<b>2</b>	<b>Health and Safety .....</b>	<b>5</b>
	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
<b>3</b>	<b>Description .....</b>	<b>7</b>
	3.1 K575X Turbo Sputter Coater .....	7
	3.1.1 Features .....	8
	3.1.2 Benefits .....	8
	3.2 Specifications .....	8
	3.2.1 Services .....	8
<b>4</b>	<b>Installation .....</b>	<b>9</b>
	4.1 Preliminary Checks .....	9
	4.2 Connections .....	10
<b>5</b>	<b>Operation .....</b>	<b>12</b>
	5.1 Display .....	12
	5.2 Settings .....	13
	5.3 Default Settings .....	14
	5.4 Initial Operating Checks .....	15
	5.5 Sequence .....	16
	5.5.1 Start .....	16
	5.5.2 Pumping to High Vacuum .....	17
	5.5.3 Pump Hold .....	17
	5.5.4 Bleeding Gas into Chamber .....	17
	5.5.5 Cleaning Oxidised Target .....	18
	5.5.6 Coating Now .....	18
	5.5.7 No. Cycles (number of cycles) .....	18
	5.5.8 Coating Finished, (completing the cycle) .....	18
	5.6 Film Thickness Monitor F.T.M (Option) .....	19
	5.6.1 FTM Parameters .....	19
	5.6.2 FTM Operation .....	19
	5.7 Vacuum Shutdown (Option) .....	21
<b>6</b>	<b>Service and Maintenance .....</b>	<b>22</b>
	6.1 Maintenance .....	22
	6.2 Changing the Target .....	23
	6.3 Troubleshooting the K575X .....	25
	6.4 Turbo Pump .....	25
	6.5 Spares .....	26
	6.6 Accessories .....	26
	6.7 Fuse Listings .....	27
<b>7</b>	<b>Appendices .....</b>	<b>28</b>
	7.1 World Wide Electrical Supplies .....	28
	7.2 Pump Plug Wiring .....	29
	7.3 Sputtering Deposition Rate .....	30
	7.4 Return of Goods .....	31
	7.4.1 General Introduction: .....	31
	7.4.2 Health and Safety Declaration .....	31
	7.4.3 Despatch .....	31
	7.4.4 Return Address: .....	31
	7.4.5 Declaration of Contamination Form .....	32
<b>8</b>	<b>Index .....</b>	<b>33</b>

## 1.2 List of Figures

Figure 2-1: WEEE Directive Symbol .....	5
Figure 3-1: K575X Turbo Sputter Coater .....	7
Figure 4-1: K575X Rear Panel .....	10
Figure 5-1: K575X Front Panel .....	12
Figure 5-2: Default Settings .....	14
Figure 5-3: Plasma Formed under Poor Vacuum .....	15
Figure 5-4: Desired Plasma Formation.....	16
Figure 6-1: Target Assembly Expanded View.....	23
Figure 6-2: Fitting Dark Space Shield Spacer .....	23
Figure 7-1: Sputtering Deposition Rate using Gold .....	30
Figure 7-2: Sputtering Deposition Rate using Chromium.....	30

## 1.3 List of Tables

Table 1: Specifications for the K575X Sputter Coater .....	8
Table 2: K575X Rear Panel Functions .....	10
Table 3: K575X Power Requirements .....	11
Table 4: K575X Front Panel Controls.....	12
Table 5: Material Density .....	20
Table 6:- Maintenance Tasks .....	22
Table 7:- Spare Parts for the K575X .....	26
Table 8:- Accessories for the K575X .....	26
Table 9:- Fuse Listing for the 230 Volt K575X.....	27
Table 10:- Fuse Listing for the 115 Volt K575X .....	27
Table 11:- Electrical supplies World Wide.....	28
Table 12: Pump Plug Wiring .....	29
Table 13: Declaration of Contamination Form .....	32

## 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 -7.4.5 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](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 K575X Turbo Sputter Coater

The K575X System employs a magnetron target assembly, which enhances the efficiency of the process using low voltages and giving a fine-grain, cool sputtering.

K575X features a rotating sample table which ensures even depositions. This method allows standard targets to be utilised, and avoids the necessity of special large profile targets.

It features a turbo molecular pump backed by a rotary vacuum pump.

The Instrument is fitted with a 57mm. diameter quick-change target giving optimum consumable cost performance. Alternative target materials are available.

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

It can be used to sputter coat targets such as Gold, and also targets that may need pre-cleaning for the removal of oxide layers, such as Chromium.

A shutter assembly is fitted as standard, which allows a sputter cleaning and the sputter coating cycle to be carried out while maintaining the vacuum.

The system can also be fitted with a film thickness monitor (FTM) as an "optional extra" for certain applications.

The system can also be fitted with a vacuum shutdown option allowing the instrument to be pumped down and switched off, with the chamber left under vacuum.



Figure 3-1: K575X Turbo Sputter Coater

**3.1.1 Features**

- Peltier cooled sputter head
- Fine coating (order of 0.5nm Cr Grain Size)
- Special Rotating Stage with Full Tilt Facility fitted as standard
- Thin Film Deposition (typically 5nm)
- 165mm Diameter Chamber
- Dual Sputter Head available as an option
- Can be integrated with Film Thickness Monitor

**3.1.2 Benefits**

- Allows sputtering of fine grain oxidising metals such as Cr or Ir
- Easy to operate
- No cooling water required
- Ultra high resolution reproducible coatings
- Fully adaptable to a wide range of specimens
- Repeatable film thickness depositions
- Easy loading and unloading of samples
- Allows sequential coatings to be made without breaking vacuum
- Can pre-set deposition thickness

**3.2 Specifications**

Specifications of the K575X Sputter Coater Unit

<b>Instrument Case</b>	450mm Wide x 350mm Deep x 175mm High
<b>Work Chamber</b>	Borosilicate Glass 165mm Dia x 125mm High
<b>Safety Shield</b>	Polycarbonate
<b>Plus Base</b>	110mm Dia x 115mm High
<b>Weight</b>	27 Kg
<b>Target</b>	54mm Dia x 0.2mm Thick (Chromium fitted as Standard)
<b>Specimen Stage</b>	60mm Dia. Rotating Stage with Tilt facility.
<b>Vacuum Gauge Range</b>	$1 \times 10^{-3}$ - $1 \times 10^{-4}$ mbar
<b>Deposition Current</b>	0-150mA
<b>Deposition Rate</b>	0-20nm/Minute
<b>Sputter Timer</b>	0-4 minutes
<b>Turbomolecular Pump</b>	60 litres/Second (Ultimate vacuum $1 \times 10^{-8}$ mbar)

**Table 1: Specifications for the K575X Sputter Coater**

**3.2.1 Services**

<b>Services</b>	Argon - Nominal 10 psi Nitrogen - Nominal 10 psi (Argon may be used as common gas)
<b>Electrical Supply</b>	230V 50 Hz 6 Amp max Supply including pump 115V 60 Hz 12 Amp max Supply including pump
<b>Vacuum Pump</b>	Pump No 2. complete with Vac. Hose & Oil Mist Filter 35L/Min 2m3/Hr



## 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.



### CAUTION - HEAVY

The unit weights 27 Kg and should be lifted by 2 persons.

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 27kg.

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. See Section 5.1.

### 4.1 Preliminary Checks

Remove Instrument from packing and place in appropriate operational position. Carry out visual inspection for any signs of transit damage. Remove Accessories Pack, and check contents against K575X 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 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 for pump plug wiring.)


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



### WARNING – HIGH VOLTAGES AND HIGH VACUUM

This equipment can produce high voltages and high vacuums in its operation.

4.2 Connections

	<p><b>WARNING – EARTH CONNECTOR</b></p> <p>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.</p>
---	---

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

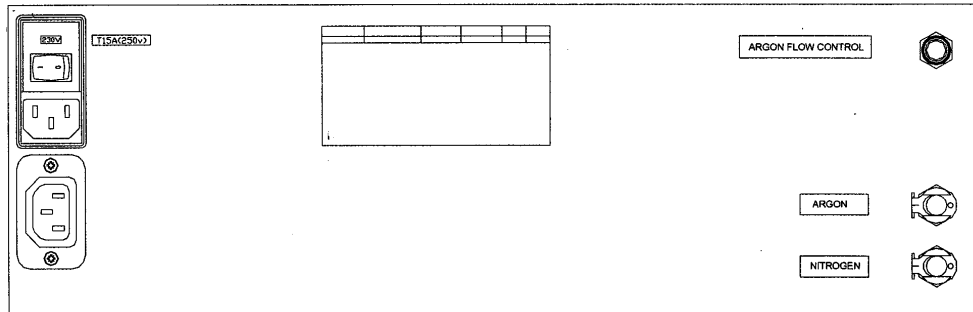



Figure 4-1: K575X Rear Panel

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

	<p><b>WARNING - OUTPUT</b></p> <p>This is for the pump supply only and is the mains voltage at a maximum of 8 Amps</p>
---	--

TITLE	FUNCTION
Power Inlet / Power on rocker Switch	Main power inlet socket, with integral on/off switch and fuseholder. For Fuse ratings - See Section 6.7
Pump Electrical Supply Outlet	Power out to pump controlled by Instrument. If the pump has it's own ON/OFF switch, ensure that this is in the ON position so that the control can be performed by the instrument
Argon Gas Inlet	Process gas inlet supply from low pressure regulator
Nitrogen Gas Inlet	Pre-regulated purging gas inlet supply.
Vacuum Outlet	Vacuum connection from turbo pump to backing pump

Table 2: K575X Rear Panel Functions

**NOTES:**

1. For full connection details of optional units where provided please refer to separate instructions.
2. 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 230V or nominal 115V. 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: K575X Power Requirements**

For fuse ratings and voltages refer to: Table 9 and Table 10 Fuse Listings

Carry out process gas connections to rear panel 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.

Argon gas is recommended at a nominal pressure of 0.7bar (10psi) for sputtering. Nitrogen gas is recommended at a nominal pressure of 0.7bar (10psi) for purging.

**NOTES:**

1. If only Argon is available then a 'T' piece should be used to connect both gas inlets. (It is **NOT** recommended to purge with air).
2. The unit is fitted with an internal pressure regulator inside the unit on the argon, which is set at 0.35bar (approx 5psi). However it is still necessary to provide the regulated input for the gas at 0.7bar (approx 10psi).

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 for the country of operation, which should correspond to the voltage label on the Instrument. The appropriate electrical supplies for countries are given in Appendix 7.1.

The vacuum connection is made by 1.5 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 ask for advice. For rotary pump plug wiring refer to diagram Section 7.2.

If the instrument is NOT going to be vented into an extraction system, then an Oil Mist Filter with metal adapter should be fitted to outlet of vacuum pump. Check that the vacuum pump is filled with correct oil. 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 recommended control.

## 5 Operation

### 5.1 Display

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

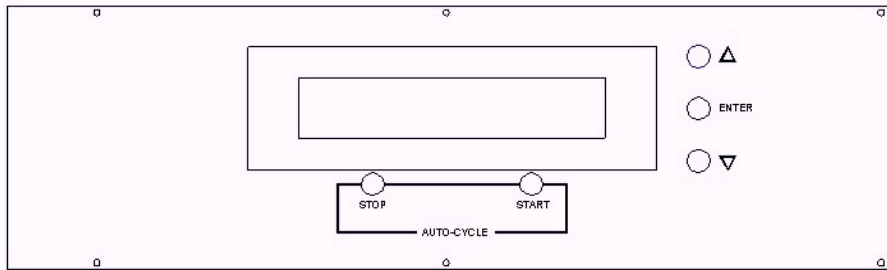


Figure 5-1: K575X Front Panel

MENU	OPERATION FUNCTIONS
Start	Non-latching switch starts the instrument cycle
Stop	Non-latching switch, terminates the instrument cycle or parameter editing, or when idle initiates a chamber purge period
Enter	Non-latching button used to enter new settings.
Up ▲ and Down ▼ Arrows	Used to increase or decrease a setting i.e. current, time etc., or to change the current option from a menu of items
Emergency stop button (Option)	This is a latching switch mounted at the front of the instrument and is operated by pressing at any time. It cuts the power to the instrument. To reset the switch it must be pulled up

Table 4: K575X Front Panel Controls

When the power is switched on at the rocker switch located on rear panel of Instrument. The front panel LCD display should illuminate and show the initialising message and, the software version and creation date similar to that shown below.

**K575 Version 1.00 (c) Emitech 11/07/99**  
**Initialising - Please Wait**

Once the instrument hardware and software has been initialised the main opening screen will be displayed, which is shown below.

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

## 5.2 Settings

It is possible for the user to change some of the parameters, which affect the running of the instrument. Pressing the **ENTER** key from the opening menu will enter the parameter select menu. The display will look similar to that below. The settings are subdivided into those that affect the sputtering directly i.e. sputter time and sputter current etc., FTM parameters (for those instruments that are not fitted with this option 'FTM enabled' is the only item of interest and this should be set to Disabled), and the Miscellaneous parameters which include Stage rotate enable etc. A full list of the settings that can be changed, their default values and the menu they appear in can be seen in the appendices of this document.

**Press ENTER to change parameters**  
**Press START to run when ready**  
> **Sputter Coating** < **Miscellaneous**  
**FTM**

Assuming that it is required to change the sputter current, the **ENTER** key is pressed to select the item highlighted by the arrows. The required item to be changed can be accessed by stepping through the parameters using the **ENTER** key. When the required item is shown on the display use the **UP** or **DOWN** arrow keys to change as desired. The display will look like that below

**UP or DOWN key to ALTER**  
**ENTER to accept, STOP to return**  
  
**Sputter Current 125 mA**

The parameters have pre-programmed maximum and minimum values. If say the maximum is reached and the **UP** key is pressed again the value will rollover to the minimum, and vice-versa.

When the required new value has been reached press the **ENTER** key to accept it. At any time it is possible exit the change parameter menu back to the opening screen by pressing the **STOP** key. Any parameters that are changed will retain their new value in an internal battery backed memory when the instrument is switched off.

### 5.3 Default Settings

Name	Menu	Default Value	Minimum Value	Maximum Value	Comment
Target Type	Sputter Coating	Oxidising	Oxidising	Noble	
Clean Current (mA)	Sputter Coating	150	100	200	
Sputter Current (mA)	Sputter Coating	125	0	150	
Sputter Time	Sputter Coating	00:30	00:00	04:00	
No. Cycles	Sputter Coating	1	1	10	The instrument will run the number of cycles selected without breaking vacuum
Pump Hold Enabled	Sputter Coating	No	No	Yes	
Pump Hold time	Sputter Coating	08:00:00	00:00:00	08:00:00	
Enable Vacuum Shutdown	Miscellaneous	Yes (if fitted) No (if not)	No	Yes	Only enable this if the hardware is fitted to the instrument (external)
Use Turbo Pumping	Miscellaneous	Yes	No	Yes	
Stage Rotate	Miscellaneous	Yes	No	Yes	
FTM enabled	FTM	No	No	Yes	
Terminate Thickness	FTM	5.0	0.1	999.9	This and below are only shown if the FTM hardware is fitted and enabled (internal)
Material Density	FTM	7.19 (Chromium)	2.70 (Aluminium)	21.45 (Platinum)	Allows user defined values as well as stored constants
Tooling Factor	FTM	1.0	0.1	9.9	
FTM Operating Mode	FTM	Manual	Manual	Automatic	

**Figure 5-2: Default Settings**

There are other parameters, which affect the instrument cycle, however these are not customer accessible.

## 5.4 Initial Operating Checks

These should be made having become familiar with the controls. Refer To: Front Panel diagram Figure 5-1. For the first run, it is best if the instrument is tested with the factory set default parameters.

From the top-level menu it is possible to check the process gas by pressing stop button. Check input pressure remains at 0.7bar (10psi). The process gas cylinder output gauge will drop slightly. Now try and run a test cycle by pressing the start button. If the instrument has been specified to have vacuum shutdown capability then the screen will produce a menu allowing the choice of running a sputter cycle or a vacuum shutdown cycle (as shown below), otherwise the instrument will immediately commence running the cycle

UP or DOWN key to ALTER  
ENTER to accept, STOP to return  
> Sputter Coat <  
Vacuum Shutdown

When this display is shown the initial choice always defaults to sputter coating. Press **ENTER** to accept this and allow unit to run through a cycle. The actual sections of the cycle are described in the next section.

When the instrument has pumped down and the valve is opened to bleed in the process gas, note the vacuum reading, a vacuum between  $1 \times 10^{-2}$  and  $5 \times 10^{-3}$  should be achieved by the time the sputter clean cycle commences, approximately  $7 \times 10^{-3}$  mbar is ideal. If necessary adjust needle valve (located at the rear of the box) to achieve this. The vacuum may fall slightly during coating.

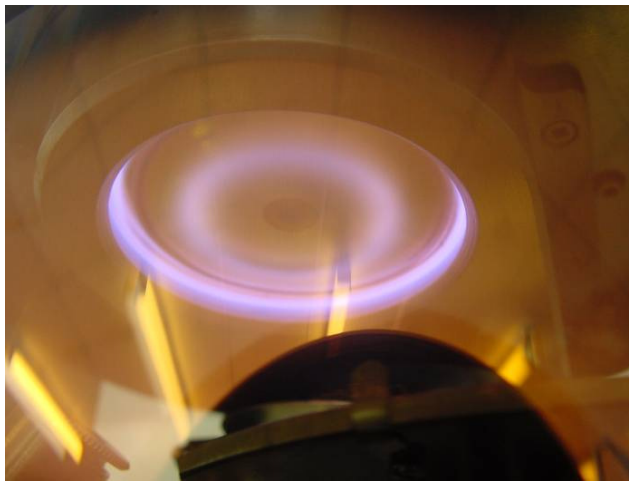
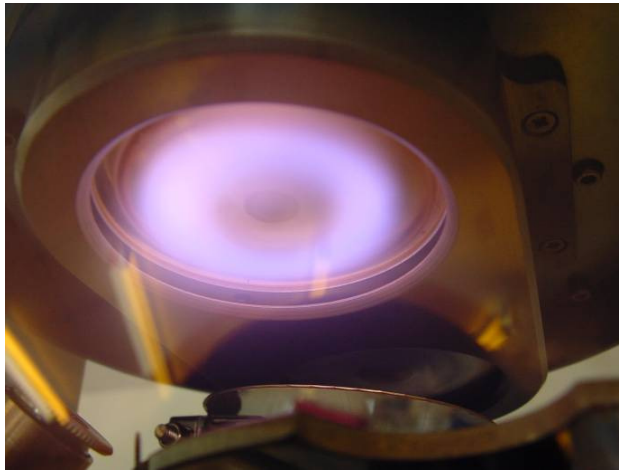


Figure 5-3: Plasma Formed under Poor Vacuum

The image above is the shape of a plasma formed when the vacuum is not good enough (i.e. chamber pressure too high) **this plasma shape is not desired** as it will cause the target to wear excessively around the outer edge and render the target unusable prematurely.



**Figure 5-4: Desired Plasma Formation**

The image above is shows the plasma constrained near the centre of the target this is **the desired plasma formation**

## 5.5 Sequence

The sequence of events for a typical oxidising target material coating run is shown below. Where the cycle deviates from this for when using a noble target material or due to options fitted these will be described.

Observe Instrument completes the full automatic cycle, and afterwards vents the chamber sufficiently so that the chamber lid can be lifted.

Observe Instrument completes the full automatic cycle, and afterwards vents the chamber sufficiently so that the chamber lid can be lifted.

### **NOTE:**

The sputter cycle is rated for a maximum 150mA for 4 minutes, with a duty cycle of 50% (off time - 4 minutes). The default settings of 125mA and 30 seconds should give sufficient coatings of Chromium for most SEM work. See also deposition chart section 6.7

### 5.5.1 Start

If stage rotate during coating has been enabled the cycle starts by rotating the stage for three seconds purely to ensure that the sample is in a secure position and will not fall off during the coat cycle. This is to save having to wait for the pump down cycle before finding this out.

After this, if a noble target material cycle has been selected the shutter is opened to move it clear of the targets, the cycle then continues with the pump to high vacuum section.

If an oxidising cycle is selected the shutter will now be closed, which covers the targets ready for cleaning.

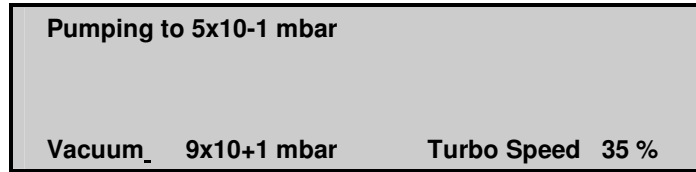
Once the shutter has closed the rotary pump is started to 'rough pump' the chamber for 10 seconds, then the purge valve will open to flush the chamber with gas for 25 seconds. After the flush time the gas valves will close and pumping to high vacuum will start.



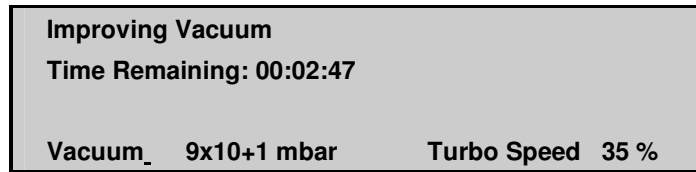
### 5.5.2 Pumping to High Vacuum

Pumping will commence with the rotary pump switching on; after five seconds the turbo pump will start. The display will look like that shown below.

**NOTE:** If peltier cooling of the sputter heads is fitted and enabled, cooling will commence at this point, and the sensed temperature will be displayed as shown below.



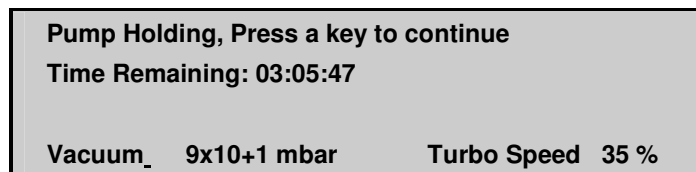
When the target vacuum has been reached pumping will continue for a further 3 minutes, to improve the vacuum and allow the turbo pump to reach full speed. The display will show a countdown of the remaining time as shown below.



When the full three minutes has elapsed, if pump hold is enabled this is executed, otherwise the cycle continues with gas bleed. By this time, the vacuum should have reached "High Vacuum", depending on the type of specimen.

### 5.5.3 Pump Hold

Pump hold allows pumping to continue for a pre-determined time or until a key is pressed. When a key press is detected the cycle will then proceed as normal



The maximum time that pump hold can be set for is 8 hours.

### 5.5.4 Bleeding Gas into Chamber

At this point the process gas valve opens and bleeds argon into the chamber through the needle valve located on the top plate. If necessary this should be adjusted to give approximately  $7 \times 10^{-3}$  mbar. The gas bleeds for a time to allow the vacuum to stabilise before the plasma comes on. The factory default for this time is 20 seconds. If the cycle is for a noble target material the coat cycle commences straight after the bleed gas period.

### 5.5.5 Cleaning Oxidised Target

With the shutter in place the plasma cleans the target. The factory default setting for the current is 150mA and for a time of 30 seconds. The coating current is measured and displayed to the nearest 5mA value.

<b>Cleaning Targets at 125mA</b> <b>Vac: 7x10<sup>-3</sup> mbar Turbo 100%</b> <b>Current Time Remaining.</b> <b>125 00:28</b>
---

Once the target has been cleaned, the shutter opens; moving clear of the targets and the coat cycle commences.

### 5.5.6 Coating Now

The argon gas continues to bleed in the vacuum may drop slightly. The factory default settings for coating are 150mA for 30 seconds. The display will look like that below.

<b>Coating Sample at 125 milliamps</b> <b>Vac: 7x10<sup>-3</sup> mbar Turbo 100%</b> <b>Current Time Remaining.</b> <b>125 00:28</b>
---

If enabled the stage will rotate while the sample is being coated. If the FTM option fitted and is enabled the current sample deposition will be displayed, there is a maximum time limit allowed for the desired deposition to be reached. If the deposition is not reached in this allowed time an error will be shown at the end of the cycle.

### 5.5.7 No. Cycles (number of cycles)

If the No Cycles parameter has been left at the default value of 1 then the cycle will finish as described in 5.5.8

If the "No. Cycles" parameter has been set to a value greater than 1 then at the end of coat period the sputtering will stop and the gas bleed will stop but the turbo pump and rotary pump will continue to operate. There will be a delay, this may vary dependant on sputter current selected up to a maximum of 4 minutes while the system cools and maintains the 50% duty cycle. The sputter cycle will repeat up to a maximum of 9 more times as described in 5.5.6 then will finish as described in 5.5.8

### 5.5.8 Coating Finished, (completing the cycle)

When coating time period has finished plasma, the process gas, and the turbo pump will switch off and, if fitted the peltier head cooling will also switch off. After a 10 seconds delay which allows for the turbo to run down slightly, the rotary pump switches off, then the purge valve will pulse on and off to help the turbo pump to slow down before opening fully to vent the chamber, approximately 5 seconds later. This pulsing is at 20% duty cycle.

**NOTE:** Sputtering rates will vary for different applications and changes in vacuum and target condition. Typically the rate at 125mA is 15 nm per minute and this can be used to give estimates of thickness. See also Deposition Charts Section 7.3

## 5.6 Film Thickness Monitor F.T.M (Option)

The FTM option is fitted internally as a PCB module which fits into the lowest board position of the interconnect PCB rack. The crystal oscillator will be connected internally to this board.

### 5.6.1 FTM Parameters

The FTM parameters can be changed from the K675X front panel. These allow the density of the material to be selected, the desired coating thickness, the tool factor (multiplier) and whether the FTM mode of operation is automatic or manual.

The method is slightly different from the main parameter editing functions. When editing the coating terminate thickness or tool factor use the **UP** or **DOWN** arrow keys as normal but each digit is edited separately, using the **ENTER** key to proceed to the next digit and **ENTER** again to accept the final value.

When editing the density, the most commonly used sputtering / evaporating materials are stored internally and using the arrow keys it is possible to step through each one. When the User Defined value is reached to edit this figure it is necessary to press either the **START** and **UP** key or **START** and the **DOWN** key. On doing this the actual value is edited in the same manner as is the terminate value, by doing each digit separately.

### 5.6.2 FTM Operation

The FTM has two modes of operation, Auto mode where the normal timer is overridden and the FTM stops the coating process when either the desired terminate thickness has been reached, or the safety time-out limit has been exceeded. This safety time-out is to limit the on-time of the H.T. supply if for some reason the FTM is not measuring any deposition. The other mode is Manual mode where the FTM measures and displays the deposition thickness but the normal timer is used to limit the coating time.

At the beginning of each coating cycle when the FTM is enabled any existing count in the FTM is reset to zero.

To change density in the FTM menu use the Up/down arrow keys and select the desired material .

To Adjust user defined density in the FTM menu

#### **Editing real numbers -user defined allowable range**

Select the parameter required

Press the **UP** or **DOWN** key to enter the edit mode. The left hand digit will start flashing to indicate this.

Pressing the **UP** / **DOWN** keys will allow this digit to be set between 0 and 9

Press the **ENTER** key to move to the next digit.

Continue to set all the digits using the above two steps. On pressing **ENTER** on the most right hand digit the value entered will be check to see if it is in range.

If in range the flashing cursor will disappear and on the next press of the **ENTER** key it will continue to the next parameter as normal. If however it is not in range the cursor will return to the most left hand position, re-enter a number with in the specified range for the parameter

Material	Density g/cm <sup>3</sup>
Aluminium	2.70
Carbon	2.25
Titanium	4.54
Chromium	7.19
Nickel	8.90
Copper	8.96
Silver	10.50
Palladium	12.02
Gold / Palladium (Au/Pd) (60:40 mix)	16.40
Tungsten	19.30
Gold	19.32
Platinum / Palladium (Pt/Pd) (60:40 mix)	19.56
Platinum	21.45
Iridium	22.40
User Defined allowable range	1.00 - 23.00

**Table 5: Material Density**

## 5.7 Vacuum Shutdown (Option)

This option allows the instrument to be pumped down and the chamber left under vacuum.

It involves the fitting of two valves, one valve is fitted after the turbo pump to isolate the chamber, and the other is fitted to the line between the isolating valve and the rotary pump. This is to allow the rotary pump to vent so there is no risk of oil being sucked back.

If this option has been ordered then it will be enabled when the instrument leaves the factory. To initiate this press the **START** key and the menu below will be displayed.

**UP or DOWN key to ALTER**  
**ENTER to accept, STOP to return**  
**> Sputter Coat <**  
**Vacuum Shutdown**

Using the arrow keys select the Vacuum Shutdown option and press **ENTER**. The rotary pump and turbo pumps will start and the screen below will be displayed.

**Pumping to 1x10<sup>-0</sup> mbar**

**Vacuum\_ 9x10<sup>+1</sup> mbar      Turbo Speed 35 %**

Once the vacuum has been reached, the turbo pump, and rotary pumps will be stopped, the isolating valve will close. After a 1 second delay the anti-suckback valve will open venting the line between the isolating valve and the rotary pump. The screen display will look like that below.

**You may now switch off power**  
**at main switch**

When this is displayed the chamber is under vacuum and the power may be switched off.


### **NOTES:**

Once this point has been reached no further operations can be performed with the instrument unless the main power is switched off and then on again.

The Isolating valve is a power to open valve. If for some reason it was required to have access to the chamber, which was under vacuum, and there was no power, the valve can be operated manually. This is achieved by removing the access plate (see Rear Panel Diagram Figure 4-1) from the rear panel, and pressing the small grey button located on the valve body until the chamber has vented.

## 6 Service and Maintenance

For technical and applications advice plus our on-line shop for spares and consumable parts visit [www.quorumtech.com](http://www.quorumtech.com)

	<b>CAUTION</b> Ensure mains electrical power is off during any maintenance and service activities
---	--

### 6.1 Maintenance

PROCEDURE	FREQUENCY
Check and clean the glass chamber and the 'L' gaskets as required, using a lint-free tissue and foam cleanser, or similar. <b>Do not use vacuum grease on 'L' gaskets.</b>	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.	Monthly
Inspect electrical power cords and plugs for general condition.	Regularly
Change oil using 1 litre of supergrade 'A' (See Section 6.5).	6 Monthly
Check oil mist filter for saturation. See Section 6.5) (This is a disposable plastic filter and cannot be reactivated.)	6 Monthly or more regularly as required.
Check vacuum pump oil level	Monthly
Replace Turbo Pump Oil Capsule as required depending upon pump type (refer to manufacturers documentation)	Yearly NOTE: This is a condition of the Turbo Pump Warranty

**Table 6:- Maintenance Tasks**

**NOTE:** A replacement target exchange service is offered for precious metal recovery. On return of your used target (Noble Metals only not Chromium), a discount made against your new purchase.

**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.

## 6.2 Changing the Target

Note the targets themselves may be fragile and may not be attached to a support. Care should be taken when replacing and centring the new target.



**Figure 6-1: Target Assembly Expanded View**

### To access the targets

- Loosen the 4 cap screws retaining the aluminium dark space shields a couple of turns each.
- Turn the dark space shields anticlockwise to free the head of the screw in the keyhole slots
- Remove the shield and clean internally if necessary.
- When using Chromium Target TK8845 unscrew the outer metal ring from the target assembly.
- The target can then be removed together with the backing plate.
- Beware! the aluminium backing plate behind the target is free to fall if the lid is closed at this stage.



**Figure 6-2: Fitting Dark Space Shield Spacer**

*The standard target thickness is 0.3 mm if a thicker target is fitted then spacers must be fitted under the dark space shield to maintain a gap of 1.5 mm between the inside of the shield and the front face of the target retaining ring as shown in the image above. Spare spacer rings are supplied in the accessory pack provided with the instrument.*

- Fit the required target. And retain it with the metal ring at the same time ensuring the target is central in the ring.
- Refit the dark space shield by locating the keyhole slots over the heads of the 4 x M3 cap head screws.
- Turn the shield clockwise and tighten the 4 screws.



### 6.3 Troubleshooting the K575X

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



#### **CAUTION**

Depending on nature of problem, disconnect power cord **BEFORE** carrying out any servicing activities

1. Check power to Instrument, neon on rear should be illuminated.
2. Check electronic supplies, LED should be illuminated on the stop or start button.
3. Check fuses, Refer to Appendix 6.7.
4. Check vacuum pump local switch should be in 'on' position.
5. Check chamber seating for vacuum leaks.
6. Check operating conditions of Instrument controls.
7. Check target and connections.
8. Check correct conditions for sputtering have been set.
9. Check all connections.

### 6.4 Turbo Pump

The instruments may be fitted with a number of alternative turbo pump types. Each type may use a different drive control and power supply. Refer to manufacturers details supplied with instrument for more information.

**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.

## 6.5 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 K575X 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
REPLACEMENT TARGETS		
57mm Dia x 0.2mm Chromium Target	TK8845	Each
57mm Dia x 0.1mm Gold Target	TK8859	Each
57mm Dia x 0.1mm Gold/Palladium Target	TK8860	Each
57mm Dia x 0.1mm Platinum Target	TK8861	Each
57mm Dia x 0.2mm Iridium Target	TK8899	Each

**Table 7:- Spare Parts for the K575X**

**Quorum Technologies can supply a wider range of target materials and thickness'. Please enquire for details.**

## 6.6 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 K575X	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 K575X**

**6.7 Fuse Listings**

**Fuse listing for 230 Volt K575X**

TITLE	RATING	FUNCTION
<b>Fuse 1</b> (1.25" X 0.25")	<b>T 10A Ceramic</b>	Main Instrument Inlet (Located External, To Rear Of Unit in mains Inlet Assembly)
<b>Fuse 2</b>	<b>4A 250V</b> Cooper S501 Schurter SP 0001.1010 Littlefuse 216004	Instrument Power Supply Internal Fuse (Located Inside Unit, on Power Supply Module)
<b>Fuse 3</b> <b>Peltier PCB</b> (20 X 5)	<b>T1A</b>	Located Inside Unit, on Peltier Drive PCB

**Table 9:- Fuse Listing for the 230 Volt K575X**

Fuses 2 and 3 are Service Technical Replaceable Only - The following fuses are not intended to be user changed. This should only be attempted by a qualified Service Technician.

**Fuse listing for 115 Volt K575X**

TITLE	RATING	FUNCTION
<b>Fuse 1</b> (1.25" X 0.25")	<b>T 15A Slo-Blo Ceramic</b>	Main Instrument Inlet (Located External, To Rear Of Unit in mains Inlet Assembly)
<b>Fuse 2</b>	<b>4A 250V</b> Cooper S501 Schurter SP 0001.1010 Littlefuse 216004	Instrument Power Supply Internal Fuse (Located Inside Unit, on Power Supply Module)
<b>Fuse 3</b> <b>Peltier PCB</b> (20 X 5)	<b>T2A</b>	Located Inside Unit, on Peltier Drive PCB

**Table 10:- Fuse Listing for the 115 Volt K575X**

Fuses 2 and 3 are Service Technical Replaceable Only – The following fuses are not intended to be user changed. This should only be attempted by a qualified Service Technician.

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

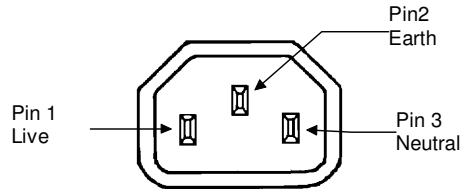
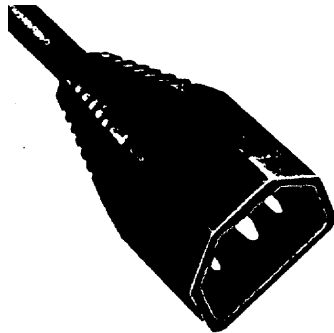
### 7.1 World Wide Electrical Supplies

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 11:- Electrical supplies World Wide**

## 7.2 Pump Plug Wiring

	<p><b>WARNING – EARTH CONNECTOR</b></p> <p>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.</p>
---	---



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 12: Pump Plug Wiring

### 7.3 Sputtering Deposition Rate

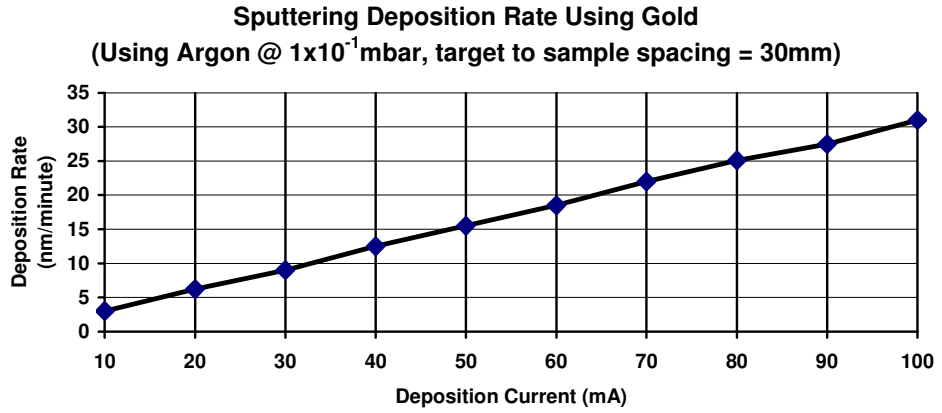


Figure 7-1: Sputtering Deposition Rate using Gold

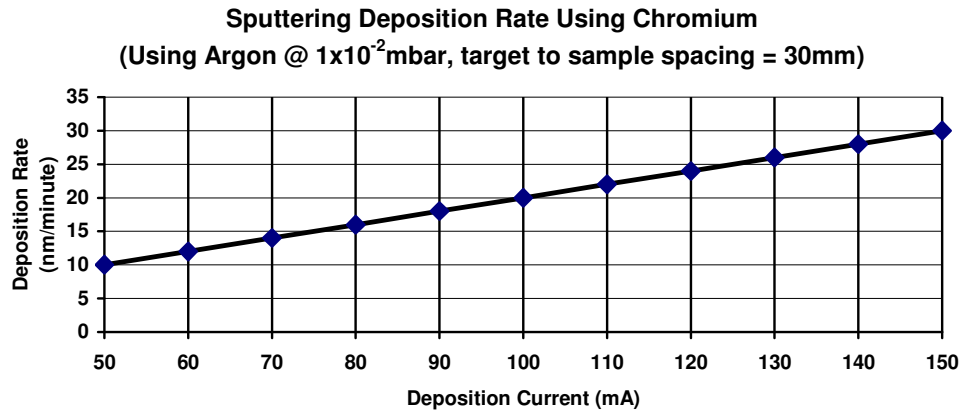


Figure 7-2: Sputtering Deposition Rate using Chromium

## **7.4 Return of Goods**

### **Safety information for the return of Preparation Equipment and Accessories.**

#### **7.4.1 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 -7.4.5 for the form)

#### **7.4.2 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.'

#### **7.4.3 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.

#### **7.4.4 Return Address:**

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

**7.4.5 Declaration of Contamination Form**

<p><b>Declaration of Contamination of Preparation Equipment and Accessories.</b></p> <p>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.</p> <p><b>This declaration may only be completed and signed by authorised and qualified staff.</b></p>				
<p><b>1. Description of component</b></p> <p>- Equipment type/model: _____</p> <p>- Code No.: _____</p> <p>- Serial No.: _____</p> <p>- Invoice No. (if known) _____</p> <p>- Delivery Date.: (if known) _____</p>		<p><b>2. Reason for return:</b></p> <p>_____</p> <p>_____</p> <p>_____</p>		
<p><b>3. Equipment condition</b></p> <p>- Has the equipment been used? Yes/No</p> <p>- What type of operating medium was used?</p> <p>_____</p> <p>- Is the equipment free from potentially harmful substances? Yes/No</p> <p>(If Yes go to Section 5)</p> <p>(If No go to Section 4)</p>		<p><b>4. Process related contamination of Equipment/ Accessories.</b></p> <p>- Toxic Yes/No</p> <p>- Corrosive Yes/No</p> <p>- Explosive* Yes/No</p> <p>- Microbiological* Yes/No</p> <p>- Radioactive* Yes/No</p> <p>- Other harmful substances Yes/No</p>		
<p>* 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.</p>				
<p>Please list all harmful substances, gases and dangerous by-products, which have come into contact with the Preparation Equipment and Accessories.</p>				
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.				
<p><b>5. Legally Binding Declaration.</b></p> <p>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.</p> <p>Name of Organisation: _____</p> <p>Address: _____</p> <p>_____ Post Code: _____</p> <p>Tel.: _____ Fax.: _____</p> <p>Name: _____ Job Title: _____</p> <p>Date: _____ Company Stamp: _____</p>				

**Table 13: Declaration of Contamination Form**



## 8 Index

<b>A</b>	
Accessories .....	26
Appendices.....	28
<b>B</b>	
Benefits .....	8
Bleeding Gas into Chamber .....	17
<b>C</b>	
C.O.S.H.H. ....	5
Changing the Target.....	23
Cleaning Oxidised Target.....	18
Coating Finished, (completing the cycle) ....	18
Coating Now.....	18
Conformity .....	6
Connections .....	10
Contents .....	3
<b>D</b>	
Declaration of Contamination Form .....	32
Default Settings .....	14, 27
Description .....	7
Display.....	12
<b>F</b>	
Fail Safe .....	6
Features .....	8
Film Thickness Monitor F.T.M (Option).....	19
FTM Operation .....	19
FTM Parameters .....	19
Fuse Listings .....	27
<b>H</b>	
Hazard Signal Words .....	6
Health and Safety.....	5
<b>I</b>	
Index.....	33
Initial Operating Checks .....	15
Installation .....	9
<b>K</b>	
K575X Turbo Sputter Coater.....	7
<b>L</b>	
List of Figures.....	4
List of Tables.....	4
<b>M</b>	
Maintenance.....	22
<b>N</b>	
No. Cycles (number of cycles) .....	18
<b>O</b>	
Operation .....	12
Operation Functions.....	12
<b>P</b>	
Preliminary Checks .....	9
Pump Hold .....	17
Pump Plug Wiring .....	29
Pumping to High Vacuum .....	17
<b>R</b>	
Return of Goods.....	31
Despatch .....	31
General Introduction.....	31
Health and Safety Declaration.....	31
Return Address .....	31
<b>S</b>	
Section Contents.....	3
Sequence.....	16
Service and Maintenance.....	22
Services .....	8
Settings .....	13
Spares.....	26
Specifications.....	8
Sputtering Deposition Rate .....	30
Start.....	16
<b>T</b>	
Targets .....	26
Troubleshooting the K575X .....	25
Turbo Pump .....	25
<b>V</b>	
Vacuum Shutdown (Option).....	21
<b>W</b>	
WEEE Compliance .....	5
World Wide Electrical Supplies.....	28







QUORUM TECHNOLOGIES LTD  
Units 1 & 3 Eden Business Centre  
South Stour Avenue  
ASHFORD  
Kent, UK  
TN23 7RS

Tel: +44(0) 1233 646332  
Fax: +44(0) 1233 640744

Email: [sales@quorumtech.com](mailto:sales@quorumtech.com)  
Web: <http://www.quorumtech.com>

For technical and applications advice plus our on-line shop for spares and consumable parts visit [www.quorumtech.com](http://www.quorumtech.com)