



Quorum Technologies

K675X Turbo Large Chromium Coater 8” Instruction Manual



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2	19/12/2003	Addition to FTM section	JB
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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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2 Health and Safety

Safety is very important when using any instrumentation.

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

Quorum Emitech 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 Emitech is not liable for any damage, injury or consequential loss resulting from servicing by unqualified personnel. Quorum Emitech 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 Emitech 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 Emitech 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 K675X Turbo Large Chromium Coater

The K675X system employs magnetron target assemblies, which enhances the efficiency of the process using low voltage, giving a fine-grain and cool sputtering.

There are three such target assemblies in the K675X, positioned to give coating over a large diameter which, together with a rotating sample table, ensures even depositions. This method allows standard targets to be utilised, and avoids the necessity of special large profile targets.

This triple-target system is particularly useful in the semiconductor wafer industry.

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

The Instrument is fitted with 54mm. 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 is fitted with a vacuum shutdown valve allowing the instrument to be pumped down and switched off, with the chamber left under vacuum.



Figure 3-1: K675X Turbo Large Chromium Coater 8"

3.1.1 Features

- Equipped with three sputter targets
- Turbo molecular pumping system
- Fully Automatic Control
- 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)
- 300mm Diameter Chamber
- Dual sputter head available as an option

3.1.2 Benefits

- Allows coating of large samples such as 8" wafers
- 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 such as 8" wafers

3.2 Specifications

Specifications of the K675X Turbo Large Chromium Coater Unit

Instrument Case	450mm Wide x 500mm Deep x 300mm High (Overall height of unit 630mm)
Work Chamber	Borosilicate Glass 300mm Dia x 200mm High
Safety Shield	Polycarbonate
Weight	42 Kg
Target	Three x 54mm Dia. x 0.3mm Thick Chromium fitted as standard
Rotating Specimen Stage	Adjustable for 6 to 8 inch Wafers, Height spacing to target 60mm.
Vacuum Gauge Range	Atmos. - 1×10^{-5} mbar
Deposition Current	0-450mA
Deposition Rate	0-15nm/Minute
Sputter Timer	0-4 minutes

Table 1: Specifications for the K675X Turbo Chromium Coater

3.2.1 Services

Services	Argon - Nominal 10 psi Nitrogen - Nominal 10 psi (Argon may be used as common gas)
Electrical Supply	230V 50 Hz 8 Amp max Supply including pump 115V 60 Hz 16 Amp max Supply including pump
Rotary Backing Pump	Two Stage Vacuum Pump No.2, 35L/Min complete with Vacuum Hose and Oil Mist Filter. 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.

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 42kg.

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 K675X 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.

Targets (particularly chromium) may require fitting at installation. See **Section 6.5**

Other materials may be pre fitted at the factory.



WARNING – HIGH VOLTAGES AND HIGH VACUUM

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

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: K675X Rear Panel

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

TITLE	FUNCTION
Power Inlet / Power on rocker Switch	Main power inlet socket, with integral on/off switch and fuseholder. For Fuse ratings - See Appendix 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
External FTM (Option)	Multiway socket for Film Thickness Monitor (Option)
F.T.M. Crystal	Coaxial BNC socket for crystal output for internal or external F.T.M. (Option)

Table 2: K675X Rear Panel Functions

**WARNING - OUTPUT**

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

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: K675X Power Requirements

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

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.

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. (refer to Figure 4-1) Vacuum hose connections. 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: K675X 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: K675X 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.

K675X Version 1.04 (c)Emitech 14/01/99
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 375 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	
Sputter Current (mA)	Sputter Coating	375	0	450	
Sputter Time	Sputter Coating	00:30	00:00	03:00	
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	
Use Turbo Pumping	Miscellaneous	Yes	No	Yes	
Stage Rotate	Miscellaneous	Yes	No	Yes	
Vent Time	Miscellaneous	01:00	00:00	04:00	
Purge Time	Miscellaneous	00:15	00:00	04:00	
FTM enabled	FTM	No	No	Yes	
Terminate Thickness	FTM	5.0	0.1	999.9	
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.

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 stable vacuum between 1×10^{-2} and 9×10^{-3} should be achieved by the time the sputter clean cycle commences. If necessary adjust needle valve (located at the rear of the box on the top plate) to achieve this. The vacuum may fall slightly to 2×10^{-2} mbar or 3×10^{-2} mbar during coating.

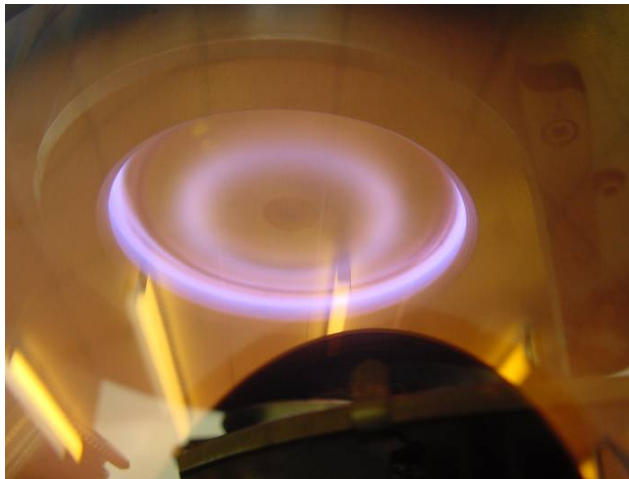


Figure 5-3: Plasma Formed under Poor Vacuum

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

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 max. 450mA for 3 minutes, with a duty cycle of 50% (off time - 5 minutes). The default settings of 375mA and 30 seconds should give sufficient coatings of Chromium for most SEM work

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.

5.5.1 Start

If stage rotate during coating has been enabled the cycle starts by rotating the stage for a 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, cooling will commence at this point, and the sensed temperature will be displayed as shown below.

Pumping to 5x10⁻¹ mbar			
		Temp.	30°C
Vacuum_	9x10⁻¹ mbar	Turbo Speed	35 %

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.

Improving Vacuum			
Time Remaining: 00:02:47			
		Temp.	30°C
Vacuum_	9x10⁻¹ mbar	Turbo Speed	35 %

When the full three minutes has elapsed then if pump hold is enabled this is executed, otherwise the cycle continues with gas bleed. By this time, the vacuum should reach 6x10⁻⁵ mbar, 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. The cycle will then proceed as normal

Pump Holding, Press a key to continue			
Time Remaining: 03:05:47			
		Temp.	30°C
Vacuum_	9x10⁻¹ mbar	Turbo Speed	35 %

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 1x10⁻² 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 375mA and for a time of 30 seconds.

Cleaning Targets at 375mA**Vac: 1x10⁻² mbar Turbo 100%**

Current	Time Remaining	Temp.
375	00:28	20°C

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 375mA for 30 seconds. The display will look like that below.

Coating Sample at 375 milliamps**Vac: 1x10⁻² mbar Turbo 100%**

Current	Time Remaining	Temp.
375	00:28	20°C

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 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 5 seconds later the gas purge valve opens to vent the chamber

NOTE: Sputtering rates will vary for different applications and changes in vacuum and target condition. Typically the rate at 375mA is 15 nm per minute and this can be used to give estimates of thickness.

5.6 Vacuum Shutdown

This feature allows the instrument to be pumped down and the chamber left under vacuum. It uses 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.

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 Vacuum Shutdown and press **ENTER**. The rotary pump and turbo pumps will start and the screen below will be displayed.

Pumping to 1x10⁻⁰ mbar

Vacuum_ 9x10⁺¹ 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.

5.7 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.

5.7.1 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.

5.7.2 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.

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 checked 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 within the specified range for the parameter

Material	Density g/cm ³
Aluminium	2.70
Carbon	3.51
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

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
Check and clean the glass chamber and the 'L' gaskets as required, using a lint-free tissue and foam cleanser, or similar. Do not use vacuum grease on 'L' gaskets.	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
It is recommended that the dark space shields around the targets are cleaned at frequent intervals	Weekly
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

Table 6:- Maintenance Tasks

NOTE: A replacement insulator spares kit is available from Quorum Emitech.

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 Emitech or approved Distributor. Only Quorum Emitech recommended items should be used. For technical assistance and advice - contact Quorum Emitech.

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.

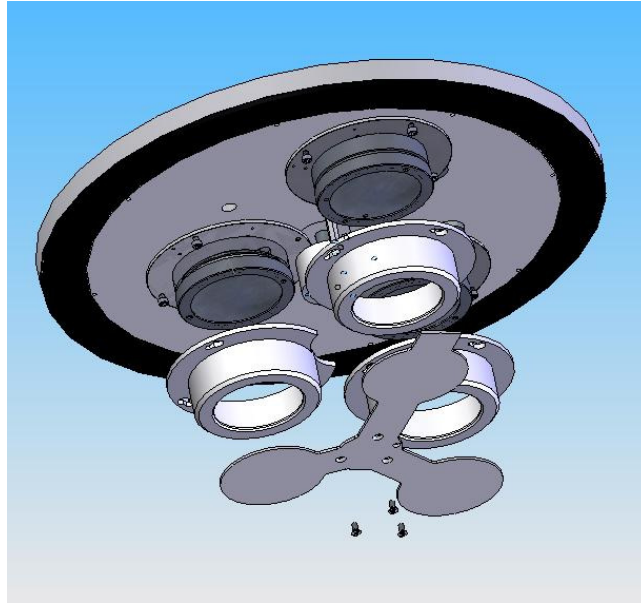


Figure 6-1: Target Assembly Expanded View

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.

- To access the targets
- Remove the shutter by removing 3 M3 x 6 long countersunk screws.
- 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.

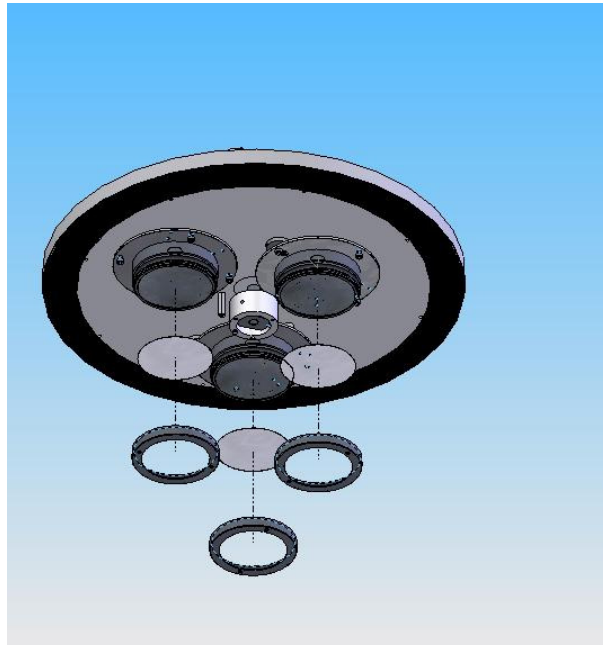


Figure 6-2: Target Assembly Shields Fitted

When using Chromium Target EK8845 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.

The standard target thickness is 0.3 mm if a thicker target is fitted then a spacer 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.

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 4x M3 cap head screws.

Turn the shield clockwise and tighten the 4 screws.

Note with the target closest to the shutter hub, the dark space shield can only be fitted in one position and is retained by only 3 screws.

6.3 Troubleshooting the K675X

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

In the event of the turbo pump overheating, or an internal fault condition occurring - the turbo controller board will automatically turn off power to the turbo pump. After the pump has cooled down, or the fault has been rectified, the turbo pump does not automatically run up.

To run up - disconnect power to unit (if this has not already been done) wait for 5 seconds, then re-apply power

The turbo card carries a T3.15A fuse. Apart from this fuse, the board is not serviceable. The card is housed in a rack, which is mounted on the front panel, and can be removed as follows:

Unscrew the rear panel assembly.

Remove the two screws, which secure the card to the side plate, and slide the card out.

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

6.5 Spares

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

SPARES FOR K675X TURBO LARGE CHROMIUM COATER UNIT	CATALOGUE NUMBER	QUANTITY
Glass Cylinder 12"	G6303	Each
Gaskets to suit	G6302	Pair
Oil Mist Filter	O7803	Each
Supergrade 'A' Rotary Pump Oil	O7802	1 Litre
REPLACEMENT TARGETS - . 57mm. Diameter Ex-Stock Delivery**		
57mm Dia x 0.2mm Chromium Target	TK8845	3 Required
57mm Dia x 1.5mm Chromium Target	TK8862	3 Required
57mm Dia x 0.1mm Gold Target	TK8859	3 Required
57mm Dia x 0.1mm Gold/ Palladium (80/20%) Target	TK8860	3 Required
57mm Dia x 0.1mm Platinum Target	TK8861	3 Required

Table 7:- Spare Parts for the K675X

** For special targets please enquire

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

6.6 Accessories

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

USEFUL ACCESSORIES FOR K675X	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 'Superglue'	A5005	3g. Tube

Table 8:- Accessories for the K675X

6.7 Fuse Listings

Fuse listing for K675X

DESCRIPTION	FUSES
Main Instrument Inlet (Located External, To Rear Of Unit in mains Inlet Assembly)	115V 15A Slo Blo (1.25" X 0.25") Ceramic*
	230V T10A (1.25" X 0.25") Ceramic
Instrument Power Supply Input (Located Inside Unit, on Interconnect PCB)	115V T5A (20x5) Ceramic
	230V T3.15A (20x5) Ceramic
Instrument Power Supply Internal Fuse (Located Inside Unit, on Power Supply Module)	F2.5A (20x5) Ceramic
Turbo Power Supply (Located Inside Unit, on Interconnect PCB)	115V T5A (20x5) Ceramic
	230V T3.15A (20x5) Ceramic
Peltier PCB (Located Inside Unit, on Peltier Drive PCB)	115V T1A (20x5) Ceramic
	230V T2A (20x5) Ceramic
Turbo Control Board (Located Inside Unit)	T 3.15A (20x5) Glass.

Table 9:- Fuse Listing for the K675X

Internal Fuses are Service Technical Replaceable Only – These 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 EMITECH, or the approved distributor.**

** If an approved distributor is not known - please contact Quorum Emitech 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 10:- Electrical supplies World Wide

7.2 Pump Plug Wiring

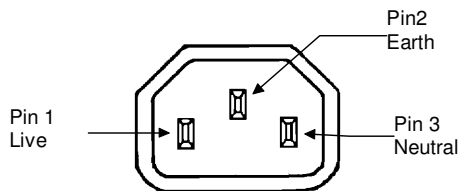
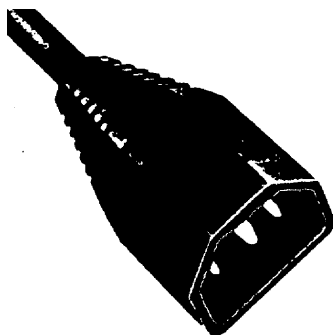


WARNING – EARTH CONNECTOR

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 11: Pump Plug Wiring

7.3 Sputtering Deposition Rate

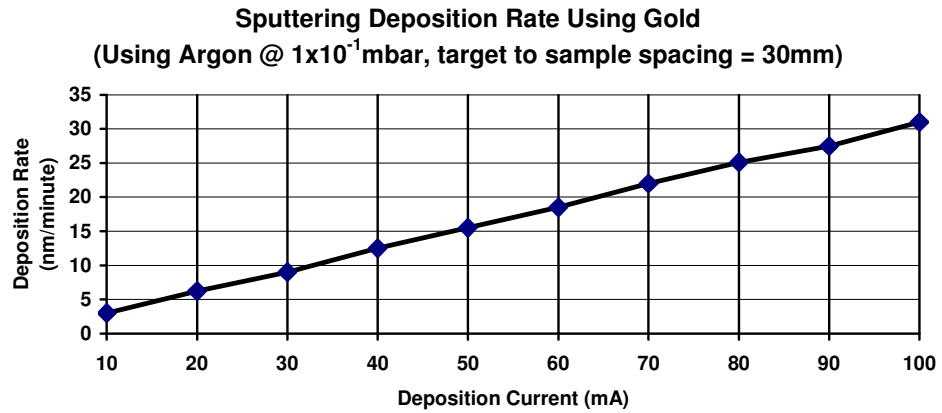


Figure 7-1: Sputtering Deposition Rate using Gold

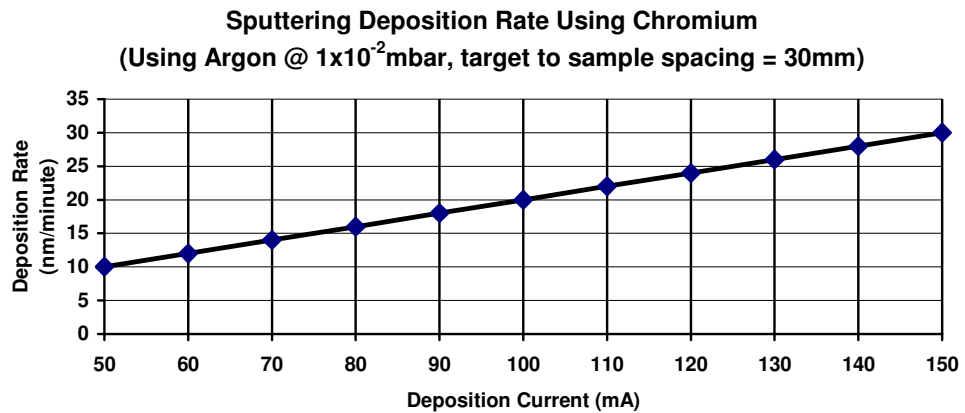


Figure 7-2: Sputtering Deposition Rate using Chromium

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 Emitech,
Units 1 & 3 Eden Business Centre
South Stour Avenue,
ASHFORD,
Kent. TN23 7RS

7.4.5 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: _____ Tel.: _____ Name: _____ Date: _____ Post Code: _____ Fax.: _____ Job Title: _____ Company Stamp: _____																

Table 12: Declaration of Contamination Form

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