



K675XD Turbo Sputter Coater Instruction Manual



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

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C E Declaration:

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

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.



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



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.



Output:

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

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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INDEX

1. INTRODUCTION.....	4
2. INSTALLATION.....	7
2.1 Preliminary Checks	7
2.2 Connections.....	7
3. OPERATION	9
3.1 Controls.....	9
3.2 Settings.....	9
3.3 Initial Operating Checks.....	10
3.4 Sequence.....	11
3.4.1 Start	11
3.4.2 Pumping To High Vacuum.....	11
3.4.3 Pump Hold.....	13
3.4.4 Bleeding Gas Into Chamber	13
3.4.5 Cleaning Oxidised Target.....	13
3.4.6 Coating Now.....	13
3.4.7 Coating Finished, completing the cycle.....	13
3.5 Vacuum Shutdown	15
3.6 Default settings.....	16
4. SERVICE AND MAINTENANCE	17
4.1 Maintenance	17
4.2 Service.....	18
4.4 Spares And Accessories	19
4.5 Pump plug wiring	21
4.6 Electrical Supplies Worldwide	22
5. SUPPLEMENT (FOR OPTIONS).....	23
5.1 Film Thickness Monitor (FTM) (Option).....	23
K675XD fitted with Film Thickness monitor.....	25
5.2 Liquid Nitrogen (LN ₂) Cold Trap (Option)	25
5.3 Supplement Twin Flow meter. (Option).....	26
6. DOCUMENT HISTORY	27

1. INTRODUCTION

- The K675XD System employs Dual magnetron target assemblies, which enhance the efficiency of the process using low voltages, and giving a fine grain, cool sputtering.
- An integral shutter and stage assembly is fitted as standard that allows a sputter cleaning and the sputter coating cycle to be carried out sequentially while maintaining the vacuum.
- 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.
- K675XD features a rotating sample table / shutter support arm which ensures even depositions. This method allows standard targets to be utilised, and avoids the necessity of special large profile targets.
- The dual shutter assembly to facilitate sputter cleaning of Oxidising targets and preventing cross contamination of targets
- It features a turbo-molecular pump backed by a rotary vacuum pump.
- The Instrument is fitted with two 54mm diameter quick-change targets 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 for each target can be pre-set.
- The gas bleed needle valve can be pre set and has electromagnetic valve back-up.
- The independent vacuum pump is controlled by the Instrument throughout the fully automatic coating cycle.
- 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 feature allowing the instrument to be pumped down and switched off, and the chamber left under vacuum.

Figure 1: K675XD Front Panel

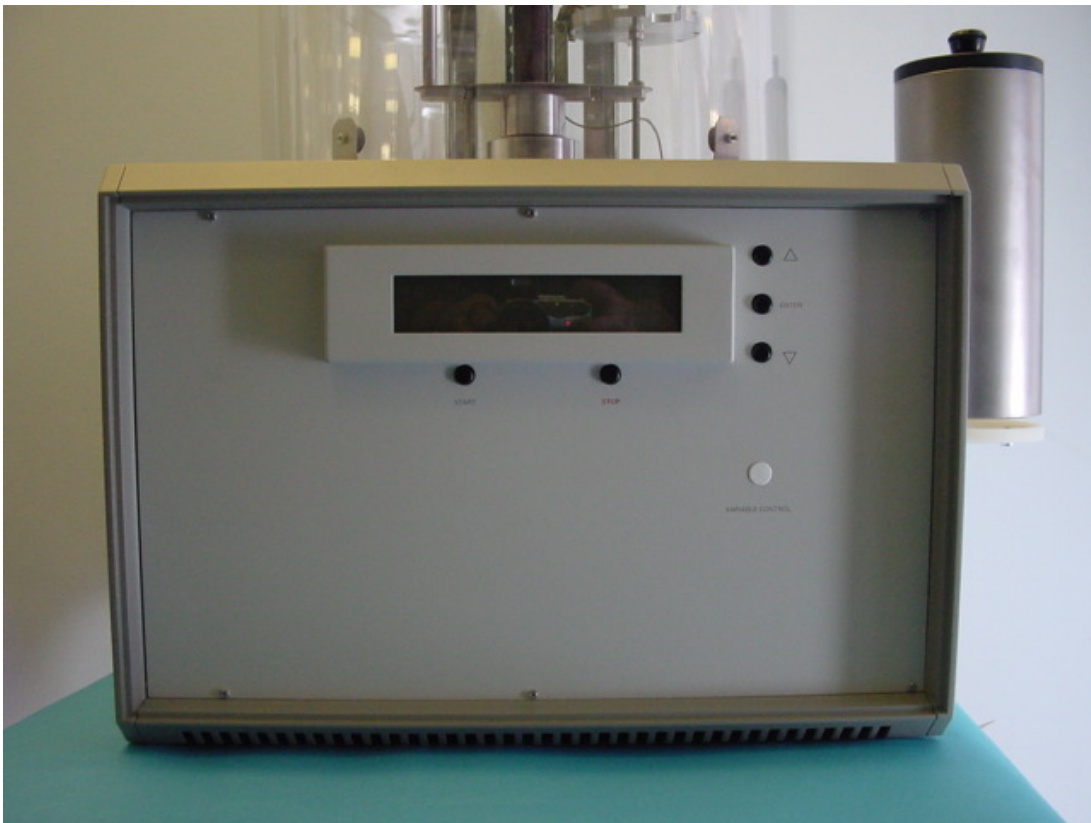


Figure 2: K675XD Rear Panel Diagram



2. INSTALLATION

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 3.1

2.1 Preliminary Checks

Remove Instrument from packing and place on appropriate operational position. Carry out visual inspection for any signs of transit damage. Remove Accessories Pack, and check contents against K675XD 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: Section 4.6 for pump plug wiring.)

NOTE:

If you are using existing or alternative vacuum pump, and have any difficulty with connections, please seek advice.

WARNING

THIS EQUIPMENT CAN PRODUCE HIGH VOLTAGES AND HIGH VACUUMS IN ITS OPERATION.

2.2 Connections.

Connections should only be made in accordance with Instructions.

UNDER NO CIRCUMSTANCES SHOULD ANY OTHER CONNECTIONS OR OUTLETS/INLETS BE USED FOR ANY OTHER EQUIPMENT OR SERVICES. (Refer to: Rear Panel Diagram Fig 2.)

Title	Function
Power Inlet / Power on rocker Switch	Main power inlet socket, with integral on/off switch and fuseholder. (For Fuse ratings see section 4.5)
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

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.

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	MAXIMUM CURRENT 10A	200 - 264V	47Hz TO 63Hz
NOMINAL 120	MAXIMUM CURRENT 20A	90V - 132V	47Hz TO 63Hz

Carry out process gas connections to rear panel (Refer to Rear Panel Diagram, Figure 2) 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 (approximately 5psi). However it is still necessary to provide the regulated input for the gas at 0.7bar (approximately 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 Section 4.6.

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 4.6.

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.

3. OPERATION

3.1 Controls.

(Refer to front panel diagram, Figure 1)

Title	Function
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

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.

**K675XD Ver 1.01 (c) Emitech 04/11/2003
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**

3.2 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 section 3.5 of this document.

**UP and DOWN key to ALTER
ENTER to accept, STOP, to return
> 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**
Target A Current 25mA

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.

3.3 Initial Operating Checks

These should be made having become familiar with the controls. 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. As the instrument has been specified to have vacuum shutdown capability, the screen will produce a menu allowing the choice of running a sputter cycle or a vacuum shutdown cycle (as shown below).

**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, the valve is opened to bleed in the process gas, note the vacuum reading. A vacuum between 1×10^{-2} mbar and 5×10^{-3} mbar should be achieved by the time the sputter clean cycle commences, approximately 7×10^{-3} mbar is ideal. If necessary adjust needle valve (located at the rear of the box on the top plate) to achieve this unless using twin flow meter option then see section 5.3. The vacuum may fall slightly during coating, depending on the duration of the cycle.



Figure 3: Needle Valve located on the rear of the box

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 150mA and 30 seconds should give sufficient coatings of Chromium for most SEM work. (See deposition charts, Figures 4 and 5)

For thicker coatings of say 100 to 300 nm the coater will sputter for longer time periods with pauses in the coating cycle to prevent over heating of the sputter targets.

A typical cycle could take 7 Minutes to achieve a vacuum ready state for sputtering. Chromium being coated at 4×10^{-3} mbar and 150 mA could yield an average coating thickness of 42 nm and a Sputter Cycle time of 14Min

Gold being coated at 4×10^{-3} mbar and 100 mA could yield an average coating thickness of 78 nm and a 11minute Sputter Cycle time.

Therefore to coat 300nm of gold could take approximately 50 Minutes.

3.4 Sequence

The type of cycle run depends on two settings. The first is the Cycle Type option, which is the first in the sputtering menu. This has settings of 'normal cycle, or 'twin head cycle'.

If it is set to normal cycle then a standard automatic cycle is used. The exact type of cycle and the target used depends on the next parameter 'Target type' with options of noble or oxidising. (NOTE this variable is ignored in twin head cycle mode).

3.4.1 Start

After this, if a noble target material cycle has been selected the shutter is closed to place the specimen under the noble target and the shutter under the oxidising target. The cycle continues with the pumping to high vacuum section.

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 15 seconds. After the flush time the gas valves will close and pumping to high vacuum will start.

3.4.2 Pumping To High Vacuum

Pumping will commence with the rotary pump switching on. If a LN₂ Cold Trap has been fitted to the machine then this will be heard to open at the same time. 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.

Pumping to 5x10⁻¹ mbar	
Vacuum	9x10⁺¹ mbar Turbo Speed 35 %

When the target vacuum has been reached pumping will continue for a further 3 minutes and 30 seconds, 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

Vacuum_ 9x10+1 mbar Turbo Speed 35 %

When the full 3 minutes 30 seconds has elapsed, if pump hold is enabled this is executed. (See Section 3.4.3)

Otherwise if running a normal auto cycle the cycle continues with gas bleed. By this time, the vacuum should have reached "High Vacuum", depending on the type of specimen.

In auto mode the cycle will perform the same operations as per the twin head mode without user intervention and for the single pre-selected target material.

If running a dual head cycle then a menu is presented prompting for a choice of which target to use

UP or DOWN key to ALTER
ENTER to accept, STOP to return
> Noble Cycle <
Oxidising Cycle

Use the up and down arrow keys to select the required target and the press ENTER. If you wish to abort the cycle press the STOP key

If an FTM is used then you will be prompted to enter the required termination thickness at this point. The FTM will then be programmed with the terminate value and the stored density for the chosen target.

At this point the bleed cycle commences (See Section 3.4.4) the bleed valve opens and time is allowed for the vacuum to stabilise.

At this point, if a noble target had been chosen the sputtering will take place.

If an oxidising target had been chosen, the target will be cleaned by sputtering onto the shutter. After cleaning the target, the shutter will now rotate to place the specimen under the oxidising target ready for the sputtering to take place. (See Section 3.4.5)

After an oxidising sputter operation has taken place the shutter is moved back under the oxidising target.

After the sputtering process has completed the following screen will be shown. This allows the instrument to reset itself ready for the next coat cycle. The time for this is 3 minutes, and is not programmable.

If an FTM is used and the selected terminate thickness is not achieved in the sputter time period then a calculated time delay is initiated during the coat cycle this is to prevent over heating of the target assembly. After the delay the coat cycle will repeat until the desired thickness is achieved.

Preparing for next coat cycle
Time Remaining 00:02:21 H:M:S

If you wish to abort the process, then you can do so at this point by pressing the ENTER key. When this time has expired the target select menu is displayed again ready for the next coating.

These can be repeated as desired.

3.4.3 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

Pump Holding, Press a key to continue Time Remaining: 03:05:47 Vacuum 9x10+1 mbar Turbo Speed 35 %

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

3.4.4 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 a reading of approximately 7×10^{-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.

3.4.5 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.

Cleaning Targets at 150 mA Vac: 7×10^{-3} mbar Turbo 100% Current Time Remaining. 125 00:28
--

Once the target has been cleaned, the shutters move clearing the oxidising target and covering the noble target and the coat cycle commences.

3.4.6 Coating Now

The argon gas continues to bleed in the vacuum may drop slightly. The factory default settings for coating are 125mA for 30 seconds. The display will look like that below.

Coating Sample at 150 milliamps Vac: 7×10^{-3} mbar Turbo 100% Current Time Remaining. 125 00:28

The stage will rotate while the sample is being coated. If the FTM option is 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 and the selected terminate thickness is not achieved in the sputter time period then a calculated time delay is initiated during the coat cycle this is to prevent over heating of the target assembly. After the delay the coat cycle will repeat until the desired thickness is achieved Up to a maximum of 11 Repeats.

3.4.7 Coating Finished, completing the cycle.

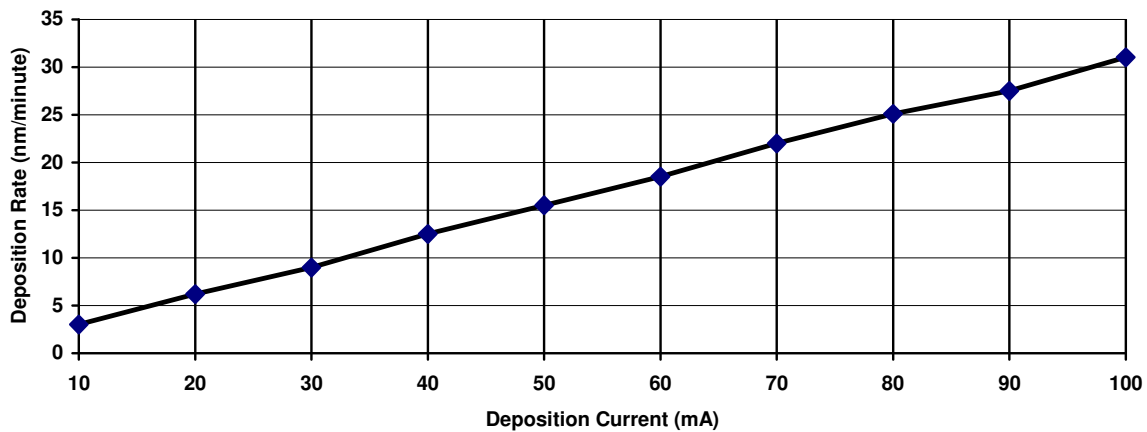
When coating time period has finished plasma, the process gas, and the turbo pump will

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 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.

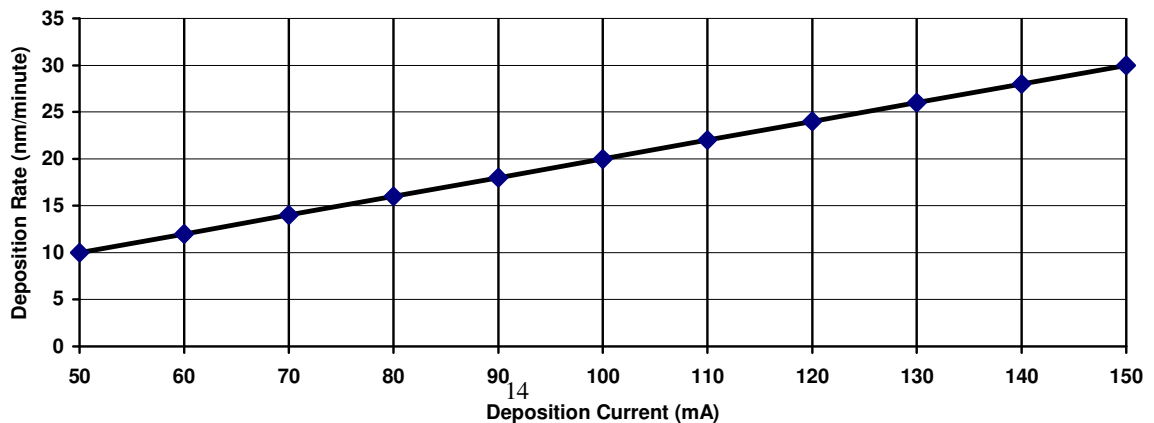
NOTE

Sputtering rates will vary for different applications and changes in vacuum and target condition. Typically the rate for gold at 125mA is 15 nm per minute and this can be used to give estimates of thickness. Please see Figures 3 and 4 on the following page (page 14), for more information.

**Figure 3: Sputtering Deposition Rate Using Gold
(Using Argon @ 1×10^{-1} mbar, target to sample spacing = 30mm)**



**Figure 4: Sputtering Deposition Rate Using Chromium
(Using Argon @ 1×10^{-2} mbar, target to sample spacing = 30mm)**



3.5 Vacuum Shutdown

This 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.

This feature has to be initially selected in the miscellaneous menu. Thereafter 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 1x10⁻⁰ 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:

1. 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 2, Page 6) from the rear panel, and pressing the small grey button located on the valve body until the chamber has vented.

3.6 Default settings

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

Name	Menu	Default Value	Minimum Value	Maximum Value	Comment
Target Type	Sputter Coating	Oxidising	Oxidising	Noble	
Sputter Current (mA) Oxidising Position 1	Sputter Coating	150	0	150	
Sputter Current (mA) Noble Position 2	Sputter Coating	25	0	150	
Sputter Time	Sputter Coating	00:30	00:00	04:00	
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	Only enable this if the hardware is fitted to the instrument (external)
Use Turbo pump	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 Target Position 1	FTM	7.19 (Chromium)	2.70 (Aluminium)	21.45 (Platinum)	Allows user defined values as well as stored constants
Material Density Target Position 2	FTM	7.19 (Chromium)	2.70 (Aluminium)	21.45 (Platinum)	Allows user defined values as well as stored constants normally Noble targets only
Tooling Factor Oxidising	FTM	2.5	0.1	9.9	
Tooling Factor Noble	FTM	5.6	0.1	9.9	
FTM Operating Mode	FTM	Manual	Manual	Automatic	

4. SERVICE AND MAINTENANCE

4.1 Maintenance

Procedure	Monthly/Weekly
Check and clean the glass chamber and the 'L' gaskets as required, using non-lint 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
The insulating PTFE outer ring around the target shield should be cleaned regularly to prevent build up of deposited material, which would cause shorting to Earth.	Weekly
It is recommended that the PTFE insulating rings around the targets are changed at frequent intervals	3 Monthly

NOTE:

A replacement insulator spares kit is available from Emitech Ltd.

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.

4.1.1 To Change Target(s).

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.

Procedure	Weekly/Monthly
Inspect electrical power cords and plugs for general condition.	Regularly
Change oil using 1 litre of supergrade 'A' (See Section 4.4).	6 Monthly
Check oil mist filter for saturation. (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

CAUTION:

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

NOTE:

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

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**If approved distributor not known - please contact Emitech direct for details.

4.2 Service

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

IMPORTANT:

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

1. Check power to Instrument.
2. Check electronic supplies, LED should be illuminated on the stop or start button.
3. Check fuses, Refer to section 4.5.
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.

NOTE:

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

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** If approved Distributor not known - please contact Emitech direct for details.

4.4 Spares And Accessories

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

Spares For K675XD Turbo Sputter Coater

Description	Catalogue Number	Quantity
Glass Cylinder 300mm diameter x 200mm high	G6303	Each
Flat Gaskets To Suit	G6302	Pair
Oil Mist Filter	O7803	Each
Ultragrade 19 Rotary Pump Oil	O7802	1 Litre

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

Useful Accessories For K575XD Turbo Sputter Coater

Description	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
Double Sided Tape	T8803	20 Mtr. Roll

Fuses For The K675XD

User Replaceable Fuses	
Main Instrument Inlet (Located External, To Rear Of Unit in mains Inlet Assembly)	115V 15A Slo Blo (1.25" X 0.25") Ceramic* 240V T10A (1.25" X 0.25") Ceramic
Service Technical Replaceable Only – The following fuses are not intended to be user changed. This should only be attempted by a qualified Service Technician.	
Instrument Power Supply Internal Fuse (Located Inside Unit, on Power Supply Module)	4A 250V Cooper Part No. S501 Schurter Part No. SP 0001.1010 Littlefuse Part No. 216004
Peltier PCB (Located Inside Unit, on Peltier Drive PCB)	115V T2A (20x5) Ceramic 230V T1A (20x5) Ceramic

T10A preferred fuse may be substituted for 10A Slo-Blo fuse - non preferred.

Fuse Standard IEC 127, CEE4.

Fuse Standard CSA C22.2/UL 198G *

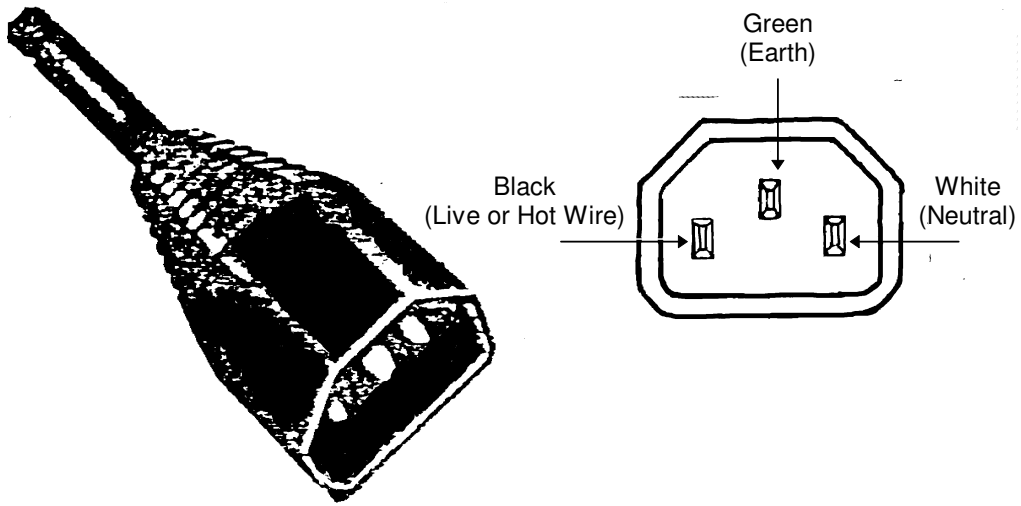
Replacement fuses can be supplied by Emitech, or the approved Distributor**

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

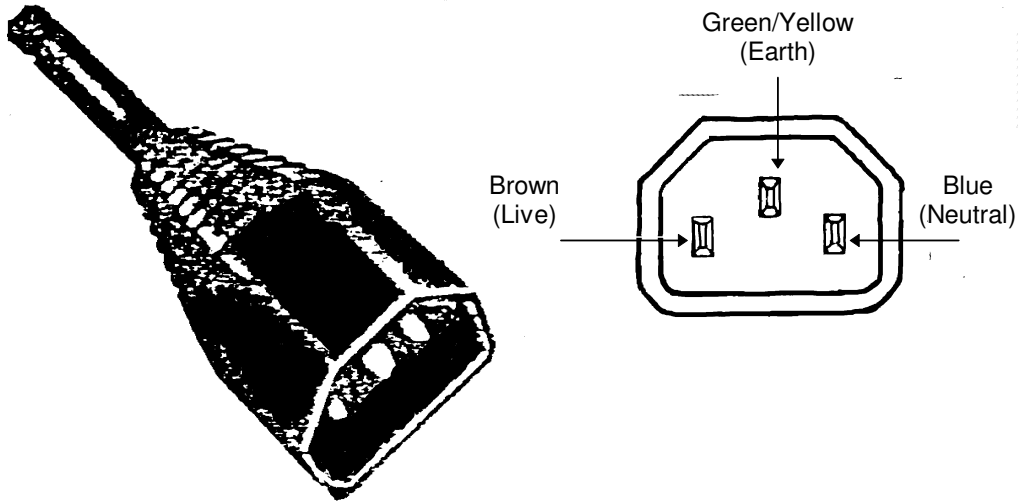
** If approved Distributor not known - please contact Emitech direct for details.

4.5 Pump plug wiring

Pump plug wiring U.S.A. and Canada



Pump plug wiring U.K. and Europe



4.6 *Electrical Supplies Worldwide*

Country	Voltage	Frequency
Brazil	115V / 230V	60Hz
Canada	120V	60Hz
Finland	230V	50Hz
France	230V	50Hz
Germany	230V	50Hz
India	230V	50Hz
Ireland	230V	50Hz
Israel	230V	50Hz
Italy	230V	50Hz
Korea	230V	50Hz
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

5. SUPPLEMENT (FOR OPTIONS)

5.1 Film Thickness Monitor (FTM) (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.

The FTM parameters can be changed from the K675XD front panel. These allow the density of the material to be selected and the desired coating thickness, and whether the FTM mode of operation is automatic or manual.

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 unless the thickness is not achieved in one cycle in which case the cycle will repeat with the display showing the cumulative thickness.

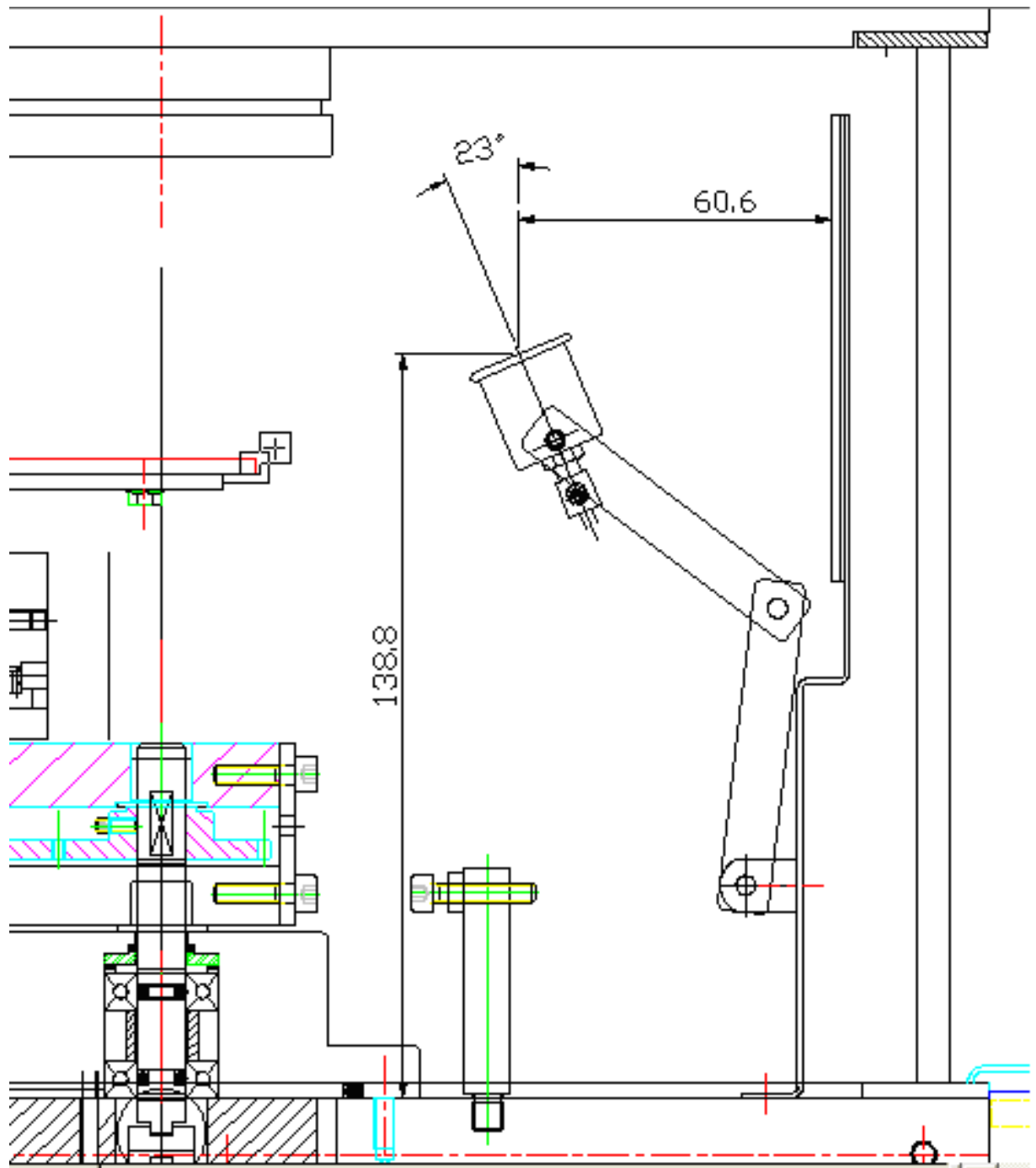
To obtain a more accurate calibration of the FTM differing tooling factors are necessary for the various materials.

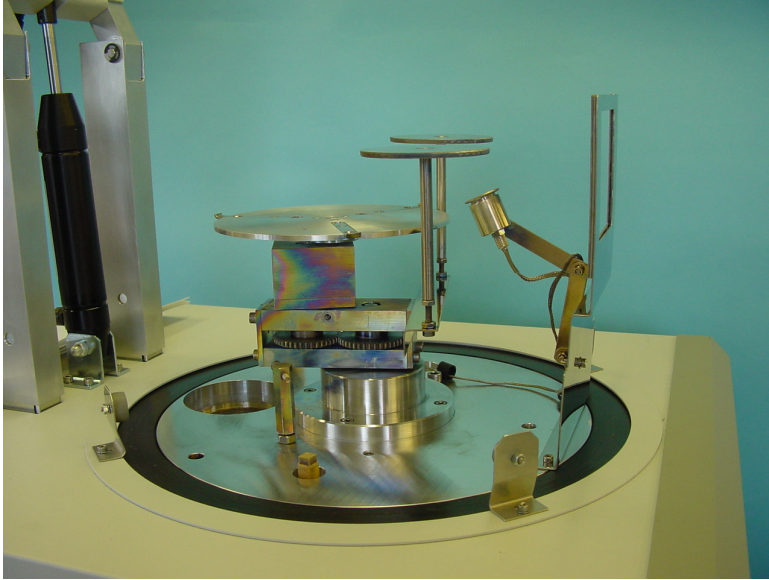
Material	Density g/cm ³	Optimum Coating Current Ma	Tooling Factor For optimum current
Aluminium	2.70		*
Carbon	3.51		*
Titanium	4.54		*
Chromium	7.19	150	5.5
Nickel	8.90		*
Copper	8.96	50	8
Silver	10.50		*
Palladium	12.02		*
Platinum / Palladium (60:40 mix)	17.68		*
Gold / Palladium (80:20 mix)	17.86		*
Tungsten	19.30		*
Gold	19.32	25	7.8
Platinum	21.45	35	7.6
User Defined allowable range	1.00 - 23.00		*

**** data not currently available for these materials***

The following diagram shows the appropriate position for the FTM Crystal holder care should be taken to positioned correctly to ensure repeatable results. There is a setting template

provided with the instrument accessories.





K675XD fitted with Film Thickness monitor

5.2 *Liquid Nitrogen (LN₂) Cold Trap (Option)*



Figure 6: Liquid Nitrogen Cold Trap with Dewar Cap and Drip Trap displayed.

If the system is fitted with a Liquid Nitrogen (LN₂) Cold Trap, the Instrument should be operated as described in Sections 2 and 3 (Installation and Operation). When using the Cold Trap for the first time, ensure there is a vacuum before initial filling of the dewar. Observe

normal precautions when handling LN₂. A dewar cap is provided and should be used when filling the dewar, utilise the slot in the dewar cap to direct venting gas away from the operator. A drip tray is also provided to trap any condensation formed, this should be emptied at the end of each period of use.

5.3 Supplement Twin Flow meter. (Option)

This option allows two gases to be proportionally mixed and introduced during the sputtering process. The flow meters are calibrated for Nitrogen but a table of alternative gas flows is available.

Two 200 mm flow meters are mounted on a bracket on the Right hand side of the instrument the common outlet from these meters is connected to the inlet marked Argon on the rear of the instrument.

The needle valve at the rear of the instrument should be unscrewed fully anticlockwise so that it has no effect when using twin flow meters.

It is the responsibility of the user to ensure compatibility of gasses used with these flow meters.

6. DOCUMENT HISTORY

Revision	Date	By:	Reason
Issue 1	14/11/2003	JB	Initial manual creation
Issue 2	13/11/04	PRM	6" Sample stage c/w FTM
Issue 3	22/11/04	PRM	Tooling factors revised
Issue 4	27/4/06	PRM	Tooling factors and delete ref to backing plates

Safety information for the return of Preparation Equipment and Accessories.

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 or manufacturer's premises during repair or service. The contamination of Preparation Equipment and Accessories has to be declared and the Health and Safety Declaration form completed.

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.'

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.

Return Address:

F.A.O.: The Service Manager,
EM Technologies Ltd
South Stour Avenue,
Ashford,
Kent. TN23 7RS.

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.

<p>1. Description of component</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>2. Reason for return:</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>3. Equipment condition</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>4. Process related contamination of Equipment/ Accessories.</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>

* 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: _____ Post Code: _____

Name: _____ Fax: _____

Date: _____ Job Title: _____

Company Stamp: _____